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EDITORIAL NOTES.

New Gas Legislation—The All-Embracing Therm.

NOTWITHSTANDING the heavy claims of the coal stoppage upon the Central Executive Board of the National Gas Council, there was no slackening-off by them, during the year ended March last, in respect of the other duties with which they are entrusted. The coal stoppage, critical as it made things, was a transient matter; and there are those affairs, which are pressing for attention, and will be lasting in their effects, which could not be neglected. The proposed new legislation for the gas industry is among these. Though only incidental information regarding the scheme has been forthcoming since the publication of the Memorandum on the subject, all have known that the matter has not been allowed to lie dormant; but that the Board of Trade, the Executive Board of the Council, and Special Committees have been busy upon the proposals, and have been working hard to shape plans into a presentable state. The existing position was disclosed by the President of the Council (Sir David Milne-Watson), at the annual meeting on Tuesday of last week. It is one of those matters which cannot be rushed. It has to follow certain procedure, which theoretically is a safeguard of all interests; in practical result, sometimes it is not. But it is hoped that it will be on this occasion; and there is fair reason to think that it will be, inasmuch as the Council are seeking to make the scheme perfectly acceptable—to the Board of Trade, as well as to the gas industry—before the matter is finally submitted to Parliament. Nothing is being left undone which can be done to make the draft measure a finished product, the constituents of which can be defended item by item. We realize fully that every proposal will undergo the minutest scrutiny, both before and after the Bill has been laid before Parliament, which Sir David is hopeful will be at the beginning of next parliamentary session.

Broadly speaking, the grounds on which the suggested new enactments have been conceived and modelled are the changes not only in the conditions of the industry, but in its environment, and the consequential need for abrogating or modifying some of the old statutory prescriptions, and establishing new ones. The developments which have been made both inside and outside the industry since the subject of looking to the future was originally discussed have revealed that the matter of the revision and extension of powers was not taken in hand any too soon, and that the early placing upon the Statute Book of a measure giving effect to the objects in view is a desideratum. As the President says, it is highly essential, in the interests of the industry's public service, that there should be improved facilities for raising additional capital; that the simplification and cheapening of procedure whereby parliamentary powers can be obtained is desirable; that the path should be eased to the effecting of amalgamations and joint working, not only among gas undertakings, but also with allied and ancillary interests; and that the lines of development of gas service and competition demand relief from the old cast-iron method of conforming to flat rates of charge, with simple discounts. It should not be a difficult matter to convince the Government how well these proposals fit in with the other work they are doing; and, indeed, are complementary to it. They are allied to the work of the Fuel Research Board, who are seeking ways to higher efficiencies and economies in the utilization of our coal supply; they fit in with the objects of the Fuel and Power Committee; they subscribe to the gaining of the objects of the new Smoke Abatement Act; they embrace the principle of effecting amalgamations and concentrations for gas production with the view of eliminating concerns which are uneconomically placed without (as in the case of the last Electricity Supply Act) a drastic, expensive, and unnecessary reconstruction. These facts, together with the one that the proposals have emanated from the industry itself, and will bear the public-service test from any standpoint, should be recommendations to the Government and to Parliament.

The light on the position which the President was able to give, without disclosing the details of "confidential" communications from the Board of Trade, indicates that the mind of the latter is also inclined to a consolidation in a direction which is significant. There is manifestly the fullest sympathy on the part of the Board with the objects of the projected legislation. But this is a serviceable opportunity. The Board have for long contemplated bringing to an end the cleavage in the industry, on one side of which the greater part sells gas on the thermal basis, while on the other there is still adherence to the old volumetric practice. So far as statutory undertakings are concerned, the Board have had, under sub-section 5 of clause 1 of the Gas Regulation Act, the power to force all statutory undertakings to come on to the therm basis. That they have not done so before, has been a surprise to many; but it is now fairly obvious that it was anticipated that a favourable opportunity would arise for, with the sanction of Parliament, accomplishing *en masse* what would otherwise have required individual attainment. By legislation the Board will be able to compel all statutory concerns (except those making less than 20 million c.ft. a year) to adopt the therm system by an appointed day. The longer the outstanding undertakings have delayed, the greater has grown the experience that all their fears are of a purely imaginary order. The Board, too, have been contemplating rounding-off the job by bringing non-statutory concerns—other than those making less than 20 million c.ft. a year—under the therm system, and by raising them to full statutory status. While there cannot be any objection to the former proposal, there might be to the latter. By those who are well acquainted with the difficulties of small concerns, there will be agreement with the view of the Central Executive Board that "the adoption of full statutory status would be to make it even more difficult than it is to-day for these small undertakings to raise capital on reasonable terms," as well as with the opinion of the President that "no useful purpose would be served by adopting the proposals of the Board of Trade in this respect." He hopes the Board will not press the matter. So much are the Central Executive Board impressed by the view that a mistake would be made if the suggestion is persisted in that they have gone farther, and have urged upon the Board of Trade the desirability of introducing into any new legislation provisions whereby even small statutory undertakings—those with a make not exceeding 100 millions per annum—should be able to obtain, by means of a Departmental Order, exemption from compliance with any restrictions which might hamper them in raising additional capital. There are probably several considerations applying to this matter; but there are two which should

particularly be before the Board of Trade. One is that most of these small undertakings are purely local, have been financed and directed by local men, and have peculiarly distinct local associations. So long as they continue in separate existence, those conditions had preferably be maintained; inasmuch as there can be no question that locally subscribed capital adds to the business stability of such concerns. Moreover, another item in the proposed legislation affects this matter. It is that provision for amalgamation and working agreements will progressively reduce the number of such undertakings; and, in the case of non-statutory concerns, it is possible that conversion to statutory status might have a retarding influence upon a consummation which is desirable in the interests of all.

It is also seen from Sir David's address that the end of their work is being reached by the Committee who were appointed by the Council to consider the question of relief from the flat-rate system of charging for gas, so as not only to place the gas industry on an equality with its competitors, but to provide a method of charging at once fair as between consumer and consumer, and contributing to the promotion of the use of gas for heating purposes. It has been a difficult question, having in view the old-established legislation of the industry; but it is imperative it should be taken in hand. The Committeee have arrived at certain definite conclusions; and they are now engaged on the useful work of preparing a statement of costs allocation which will enable every undertaking—large and small—to determine for itself how the recommendations can be made to apply to its own circumstances.

It is probable that the Council's Memorandum on the proposed legislation will, in the first instance, be submitted by the Board of Trade to a Committee—maybe the National Fuel and Power Committee—and then recommendations will be made to the Cabinet upon which legislation can be introduced.

Low-Temperature Carbonization—A National Trial.

It is patent that the road of least resistance to the success of any system of low-temperature carbonization is through the gas industry, if it can be shown that it would be a profitable adjunct. The gas industry has the means of disposing of the gas; and every community has a gas undertaking carrying on active business in its midst, and therefore in an organized position to trade in the coke produced. Every concentration of low-temperature plant away from such established circumstances would have to pipe the gas to gas undertakings, would have to transport the coke (perhaps considerable distances, and to its detriment), and would for commercial success have to place great reliance upon the oil products, in face of the competition from imported oil and spirits. The weight of advantage lies in the main development of the system in conjunction with gas-works—if commercially feasible. The Government and the Department of Scientific and Industrial Research recognize this, and so do the Fuel Research Board. This is seen from the annual report of the Board, which prefaces that of the Director of Fuel Research (Dr. C. H. Lander). The former gives official information regarding the agreement which has been entered into between (on behalf of the Government) the Mines Department and the Department of Scientific and Industrial Research on the one hand, and the Gas Light and Coke Company on the other, for carrying out a working-scale test (100 tons per day) of a low-temperature system on commercial lines—so enriching our knowledge by actual working and financial data. It will be noticed from the report of the Board that, in this matter, Sir David Milne-Watson was approached not only as Governor of the Gas Light and Coke Company, but as President of the National Gas Council. The fact is significant, as while it was right the Government should, in the first place, open up negotiations with the premier Gas Company, the recognition of the National Gas Council, through the President, brings this large experiment into being as a matter in which the whole industry is largely concerned; it also reflects the importance of the position held by the gas industry in relation to the fuel problems of the country; and it accentuates the national character of the problem in hand. And it is a national problem, with at its base the existing reliance of this country upon the carriage across the seas of the oil and spirits which are now indispensable, and are growing daily more so. All else could be dealt with by high-temperature processes, without any disturbance of their development.

But there must be no misconceptions by the authorities regarding potentialities. It is acknowledged by the Board that the technical difficulties of low-temperature carbonization have been largely overcome; that several processes have been devised which yield oil, tar, a rich gas, and a good lump smokeless fuel. But this is followed by the statement that the difficulty has been to devise a method which can be worked so cheaply that it will be commercially possible to carbonize the whole, or a large portion, of the 40 million tons of coal now burned yearly in the raw state for domestic purposes, bearing in mind that this coal is one of the most highly-priced products of our mines. There must be no illusion as to that 40 million tons, or even the major part of it, being some day carbonized at low temperatures. We have Dr. Lander admitting that, assuming commercial proof, it will yet take several—perhaps many—years before more than a fraction of that quantity of coal, let alone that used for industrial purposes, could be brought under low-temperature treatment. So far as domestic fuel goes, the public are making considerable strides in their demands for gas—clean, labour-saving, and claiming no storage in the house—and that demand cannot be met by the low yield of rich gas from low-temperature carbonization. No one can foresee what will happen; but it is more difficult to picture the perpetual reign of solid fuel—smokeless or otherwise—than it is to visualize the eventual state of supremacy of a labour-saving fuel, stored not on the premises of the user, but at the place of production, and that place the gas-works. It is the natural goal of evolution in respect of heating.

However, that is looking far ahead. Immediate interest lies with the agreement into which Sir David Milne-Watson has entered on behalf of his Company. On their part, they are finding the site, will act as managers of the plant, and will bear all management and running costs. After examination by the Company's experts of the low-temperature processes which are being developed in this country and on the Continent, the plant at the Fuel Research Station was considered to be the one most promising for trial in conjunction with gas-works. It has been agreed that a subsidiary Company should be formed under the title of the Fuel Production Company, Ltd., the capital for which has been guaranteed under the Trades Facilities Act. Naturally, the Gas Light and Coke Company could not be expected to take the whole risk of this large commercial experiment, though realizing the desirability of co-operating with the Government in putting the system to practical test. The agreement is for three years. Working, it is hoped, will commence next winter; and at the end of 1930, the Gas Light Company will have the option to purchase the plant, or clear the site, and dispose of the plant on behalf of the Fuel Company. With the management, close touch will be maintained by the Mines Department and the Fuel Research Department; and independent records—working and financial—will be available to them. It is interesting to note that the public interests are being safeguarded in respect of any patents that may be taken out as a result of these operations, that full details of the plant and the results will eventually be published, and be freely at the disposal of any company desirous of working the process. Thus the national and industrial interest in this large-scale experiment is placed beyond question.

In Dr. Lander's report, it is mentioned that there are probably 200 methods of low-temperature carbonization which have been suggested, and more or less proved up to the laboratory stage. Some have got beyond this. Some have reached intermediate scale working; a few are approaching full-scale working; and two or three have arrived at commercial stage status, but have not yet evolved audited accounts and actual profits which can be investigated as arising from normal working conditions. It is emphasized in the reports of both the Board and the Director of Fuel Research that, though the system of retorts developed at the Fuel Research Station is con-

sidered the most suitable type for this trial, it does not follow that there are no other types of which some, while possibly unsuited for gas-works, may be equally, or better, suited for use under other conditions—for instance, for erection at power stations or at collieries for the treatment of special types of coal. Dr. Lander expressly says that it is extremely unlikely that any one system of low-temperature carbonization will ever be adopted to the exclusion of all other systems. The type of plant to be aimed at will depend on the object sought, and the available raw materials. It is therefore plain that the Fuel Research Board have an open mind on the point of superiority. They do not claim it for their own plant; they do not concede that any other plant can at present claim it. They are not convinced that any one plant will satisfy all requirements. It therefore resolves itself into the survival of the proved fittest—and "the proved fittest" may be in the plural.

Fuel Research Report.

PERUSING the other parts of the annual report of the Fuel Research Board, and that of Dr. Lander, one cannot fail to be impressed by the large development of the work of the Fuel Research Station and of its value to the country at large. It may be that a monetary assessment cannot be made of the issues of the work that is carried on. That is rarely possible in such research. But we are all conscious of the fact that the benefit to the nation generally is there in the aggregate of resultant efficiency and economies which are promoted by the findings. Activities are expanding; and, as they do this, there is clearer and clearer vision of the divers ramifications of our fuel problems which, as Dr. Lander rightly points out, have their native features just as have the fuel problems of Continental countries and America. There is recognition that this country has to be alive to all movements relating to fuel, whatever its nature, in other countries; and we have to show reciprocity by divulging what is being done and has been accomplished here. Inter-communication of this kind cannot properly exist without a central national organization such as we have in the Fuel Research Board and their experts; and one of the best processes of effecting inter-communication is by personal contact. We are glad, from general observation and through the present reports, to see the appreciation of this by the Board. Dr. Lander was at the Pittsburg Conference of the fuel experts of the world, and contributed to the proceedings. On no occasion where there is international conference should there be the omission of representation from this country's Fuel Research Department. They are (so to speak) our accredited agents and guardians in this matter. It is also noticed that the British Committee of the World Power Conference have appointed the Director of Fuel Research to be the Chairman of the Technical Committee who will deal with the technical matters associated with the conference on fuel which is to be held in London in the autumn of next year.

The Board, too, through Dr. Lander and other members of the staff, are establishing more intimate relations with fuel producers and large fuel users at home, through contribution to, or presence at, their meetings, and participating in the discussion of their various problems. This is all to the good; it has reciprocal advantages. It emphasizes the interest, and the desire of the Board to help the solution of industrial fuel problems; it helps to give a lead; it assists the investigators to appreciate more fully the views of others regarding the problems; it gives opportunities for establishing relations of a character beneficial to the activities of the Department. As we say, we are pleased to see this growth on the personal side; it is giving the Board a power which could not be realized if they and their experts occupied sealed quarters and were unapproachable. Fortunately, the contrary is the case; the result, nationally advantageous.

The manner in which the question of fuel has been forced to the front during recent years is remarkable. It has risen from a state of neglect to an insistent topic for all industries. It is a case where the movement has not come from the bottom, but from the top. The Department of Scientific and Industrial Research elevated in a single move a chaotic state to a matter of national importance, which required exploration with the view of creating order out of disorder, and gaining an incremental efficiency out of inefficiency. If nothing more had been done by the Department than to educate the country to the necessity for the old fuel order giving way to a new one, the work and expenditure incurred would have been worth while. The subject now finds increasing place in the programmes of our scientific and technical bodies, new organizations have come into being to deal with it, and the Government have now a Fuel and Power Committee whose work is largely to investigate conditions and to advise upon the courses that should be taken in order to co-ordinate and conserve fuel use. We look for much value from this body, as it will, we feel confident, do much to bring into application the fruits of scientific research, and into profitable account much of the waste that exists through indifference or lack of knowledge. The Board of Fuel Research welcome that Committee, as they also do the research into fuel problems, which is proceeding at certain of the universities and other technological institutions, as well as in the industries themselves. They are glad to see this liveliness. But in the plethora of effort there is a danger; it is that too much division will tend to cause undue rambling, and produce less of a constructive nature than might fairly be expected from so much endeavour. Of course, each industry has problems of its own, which require special investigation; but they stand apart from the more general problems. However, the main satisfaction is that this is all testimony to an awakened interest and desire to do better in respect of fuel than in the past, and that is a large gain.

Naturally, the course of the work of the Board was partly affected last year by the coal stoppage; but there is so much to be done and in so many directions that there was no lack of work for the members of the staff. We will not touch here upon its variegated character. It is reviewed in later columns; and it speaks for itself. In it there is, though unwritten, an invitation to look forward to greater developments.

The Effluent Investigation.

THE gas industry is getting to close grips now with the question of liquor effluents from gas-works. The *ad hoc* Committee appointed by the Institution, under the chairmanship of Mr. C. F. Botley, M.Inst.C.E., has made an excellent start, as is seen by the first report they have issued. The fact that Prof. Cobb is the Hon. Secretary of the Committee, Dr. A. Parker, the Deputy Secretary, with Dr. A. C. Monkhouse as the Research Chemist, and that the composition of the Committee includes chemical and engineering experts who will keep close supervision over the ways the investigators should go, show that there is no intention of allowing this matter to drift any longer, but that it is to be probed to the bottom to see what can be done of a practicable nature. The last thing gas undertakings wish is to be a nuisance to anyone, so far as it is possible to avoid it in carrying out statutory responsibilities and public obligations. They fully recognize the detrimental effects that spent gas liquor, owing to its constituents and colour, have on the water of streams, which renders it anything but wholesome for man, fish, or cattle. They also know that its capacity for oxygen absorption retards or prevents the self-purification which, in ordinary circumstances, takes place in streams; and that its harmful effects upon sewage purification is not unnaturally regarded by local authorities with a most unfriendly eye. In the first report of the Committee, which we commenced to publish last week, and of which certain sections are given in this issue, there is a highly informative Memorandum prepared by Dr. Parker, which affords to all who have not intimately followed this effluent question from the source to the present state of affairs a compendious introduction to the work of the Committee, and to developments which, it is hoped, will result so as to reduce the trouble, if not to make spent liquor perfectly innocuous. An account is supplied of initial experimental work by Dr. Monkhouse at the Hinckley Gas-Works, through the kindness of Mr. F. Lee and his Committee; and it is in prospect that similar work will, through the

courtesy of Mr. P. N. Langford, be possible at Coventry. The investigations at Hinckley are to be pursued when certain modifications have been made in the plant.

The two objects of the Committee are: (1) To investigate the methods which might be adopted for minimizing the production of gas liquor effluents; and (2) to render such effluents suitable for running into town sewers or into rivers and streams. Both are desirable lines of work; but, having regard to effects, the second is the more imposing and difficult, and the one which is likely to be most effective. Various methods have been proposed for reducing the volume of liquor; and a concise review thereof is made by Dr. Parker. Perhaps the day will come when direct ammonia recovery will be possible; but, in the varying gas production circumstances of a gas-works, that day is not yet. At present, therefore, the most promising line of work appears to be in the direction of diminishing the most objectionable constituents—phenols, thiocyanate, and thiosulphate—in the spent liquor. Modifications of practice have been proposed with the object of reducing the total amounts by lowering their concentration in ammonia liquor by the early separation of tar from liquor, by the minimum circulation of liquor, and by the removal of cyanide. But further systematic investigation of these plans is necessary. A large amount of work has been done on methods of purification or disposal of spent liquor; but here again there has not been anything wholly successful. There is, of course, the process for the removal of phenol and colour from spent liquor by passing through it steam and hot flue gases; and, as Dr. Parker points out, the most satisfactory published results by this method have been obtained at the Hornsey Gas-Works, where decolorizing and dephenolating towers have dealt with the whole of the effluent liquors produced in the manufacture of 2½ to 3 tons of sulphate of ammonia per day. Analyses indicate a volatilization of 71 p.ct. of phenols and a reduction of 42 p.ct. in the oxygen-absorbed figure. But while the volatile phenol is removed, the higher tar acids are not, and thiocyanate and thiosulphate are not affected.

Another point is that at Hornsey the liquors are from horizontal retort working; while vertical retort liquors contain large proportions of the higher tar acids, which have been the subject of investigation during the past few years by Dr. T. Lewis Bailey (Chief Inspector for England and Wales under the Alkali Works Regulation Act) and his staff. As Dr. Bailey has told us, these objectionable compounds are especially noticeable in the liquors from certain sections of the condensing plant on vertical retort systems, and the effluent spent liquor invariably develops a deep brown colour on exposure to air. The discoloration of the liquor is accompanied by the absorption of a considerable amount of oxygen; and it is not therefore surprising that strong objection is taken to the discharge of such liquor into sewers and watercourses. In his last report, Dr. Bailey referred to an American patent which states that, if an ammoniacal liquor containing phenol be maintained at a suitable temperature—between 98° and 100° C., or higher—the phenol content will be combined and driven-off with the ammonia. With a gas liquor rich in ammonia, the ammonia may itself be sufficient to drive-off the phenol. If the ammonia content be low, the patentees propose to provide additional ammonia prior to distillation. The point is of considerable interest in relation to the treatment of effluent liquor from ammonia stills, as a large proportion of the phenol (in some cases up to 40 p.ct.) in the ammoniacal liquor distilled is volatilized with the ammonia, and condenses with the devil liquor. This brings us to mention that the separation of the devil liquor from the general body of spent liquor, and its separate treatment by evaporation in waste-heat flues, has been proposed as a means of freeing the effluent spent liquor from a substantial proportion of what may be termed its most noxious constituent. This is done in some gas-works; and it is obvious that the evaporation of the devil liquor in this way materially reduces the total work of purifying the effluent. This process of evaporation and many other matters, including the extraction by solvents of phenol from spent liquor or ammonia liquor, are dealt with by Dr. Parker in his valuable Memorandum.

The subject of the treatment and disposal of liquor effluents from gas-works is a complex one, and involves many problems; and their solution will require much patient work by the Committee and their Research Chemist. But some of the best talent and capacity have been brought into co-operation to deal with the task. Nevertheless, though the subject is a pressing one, definite conclusions can only be realized by much research and expenditure of time. Even work which has been done, and which has had so far no issue, may have to be re-explored to ascertain whether there is a known sufficient reason for non-success, unless, happily, a simple and inexpensive process for helping us out of this particular affliction speedily comes to light.

A Big Cost.

In his address at the annual meeting of the National Gas Council, Sir David Milne-Watson, referring to the coal stoppage, stated that it has been estimated that the coal strike increased the coal bill of the gas industry by £15,000,000; but, on the average, the price of gas was temporarily increased by not more than 25 p.ct. It is, as Sir David says, a proud position to be able to point to the fact that, not only did the industry not fail the public in the hour of their need, but that, after a few brief months, it has been able to revert to pre-strike prices.

Gas Mantle Import Duty.

The polemical subject of the import duty on gas mantles has again been before the House of Commons, as was seen by our "Parliamentary Intelligence" last week. There was an attempt to reduce the Customs duty, which was negatived. It will be seen by the report (see p. 115) that the arrangement which the British mantle makers effected with the German producers is not the vicious instrument which some opponents have represented; it was for defensive purposes, as explained by Sir Henry Jackson, speaking for the manufacturers in his constituency (Wandsworth Central). Employment has improved in the home mantle industry; and Sir Henry stated that the average increase in the wholesale price of mantles during the year compared with the preceding one was less than 1s. gross, which has a fractional effect per mantle.

British Road Tar Association.

The minutes of the Central Executive Board of the National Gas Council inform us that the draft constitution for the British Road Tar Association, as previously submitted, has been withdrawn, and that the draft now before the Board, instead of setting up a Coke-Oven Tar Producers' Board and Gas Tar Producers' Board, proposes that members of the Association should be individual gas and coke oven undertakings. The basis of subscription, however, will remain at 3d. per ton of crude tar produced. For the first year, the work of the Association will be undertaken by a nominated Council representative of gas tar producers, coke-oven tar producers, tar distillers, and co-operative groups. This will enable the Managing Council by experience to review the position at the end of the first twelve months, and then, if thought fit, to submit any constitutional amendments to a general meeting of the Association. The draft constitution has also been modified in order to endeavour to provide that the districts producing large quantities of tar shall have adequate representation.

Miners' Wages and Employment.

The Labour-Socialists in the House of Commons show a masterly capacity for examining from a single point of view the subjects in which they are concerned. The discussion in the House last week on the situation in the coal-mining industry gave illustration of this. It was pointed out by Mr. Varley that the miners are producing more per shift, but are now earning a few pence less per shift. He did not examine the question from the point of view of seeing whether or not a large part of the number of men now in employment are extremely fortunate in having work to do, in view, first, of the trade-destroying tactics of the Miners' Federation last year, and, secondly, of the extent of coal production in the world to-day, which was vastly stimulated in other countries also by last

year's doings. The Government and the coal owners are considered by the myopes of the Labour-Socialist party to be blameworthy for the present conditions; but the Executive of the Miners' Federation and their compeers in other trade unions are, of course, immaculate. The biggest fools in the world are those who speak and act as though they believe all other people are mentally deficient.

Had Prices not been Lowered.

With the state of coal production in other countries, in order to regain business abroad and to get industry on its feet again, the British coal owners have had to cut prices considerably, with the result that deficiencies are reported from several coal areas, and wages have to suffer somewhat. This is unavoidable. Trade must be restored; and it is to the miners' interest that it should be. It is a first essential after the great folly of last year. If, in view of the coal circumstances of the world, the owners had not pursued the policy they have done, and if production costs per ton had not been reduced, the miners would have been in worse case than they are now, due to their misleaders, who are still trying to deceive and to create trouble. There is more employment in the coal industry today, and therefore less unemployment, than there would have been had conditions remained as they were in pre-stoppage days. The miners should be made aware of this, but certain it is they will not be through the Miners' Federation or any of the associated unions. Their policy is, by circulating forebodings, and causing people abroad to be chary of entering into long-term contracts for British coal, to make the miners think there is trouble ahead. The miners have only got to do their part until, say, next autumn, and help to tide the industry over the season of low demand, to find things greatly improved in the new circumstances. It is believed by authorities connected with the coal industry that bottom prices have now been reached, and that with the close of the summer British coal will be able to command better prices. To appreciate that things are not as bad as is represented, there are two or three definite facts that the miners should bear in mind. The first is that the number of miners who were out of work at the end of June was 233,291, or 81,435 less than in June, 1925; the second, that in 1926 wages were equal to 12s. 4½d. per ton, and this year 11s. 1½d.; and the third, that many more collieries would not be working now if the same rate of cost of production prevailed as before the coal stoppage. The miners should consider what these facts mean to them.

Changing Circumstances.

The coal industry is suffering not only from the long stoppage of last year, but from changing circumstances. We have referred to coal production increasing throughout the world. Col. Lane-Fox, during the discussion in the House, made the remarkable statement that, during 1926 (when, owing to the stoppage, 137,000,000 tons of British coal were not available), the world production still remained at 1,181,000,000 tons. This shows how rapidly other countries speeded-up their coal hewing in order to fill the gap in output of British coal. The Miners' Federation served well the coal-producing countries abroad; and now they are not satisfied with the consequences. High production has not slackened; and it is largely due to the surplus coal in the world that prices are low. Yet we cannot reduce our production here without at the same time making a proportionate diminution in employment. Then again, it must not be forgotten that coal is now being used more economically through improvements in heating appliances of all kinds. Furthermore, oil and water power have made a difference to consumption. In every country, through these causes, the consumption of crude coal per head of the population has been lessened. The Labour-Socialists have much to learn as to the truth of things if the discussion last week in the House is a true representation of the limits of their knowledge concerning the situation in the coal industry. We wonder whether they ever seriously consider who is much to blame for that situation.

Commercial Road Transport.

The Federation of British Industries have addressed a letter to the Prime Minister in which they stress the necessity for the continuous development of roads for commercial transport; at the same time, the Railway Companies have set themselves seriously to work to compete more effectively with road transport, which they are now acutely feeling. In the letter from the "F.B.I.," reference is made to the transfer of the balance of the road fund to the Exchequer, in return for which the Chancellor stated that the Exchequer would assume the responsibility of financing the expenditure of the Road Department in the regular manner throughout the year. The Federation consider it of very great importance that the development of roads required for commercial transportation should be carried on continuously, and on an adequate scale. Moreover, they believe that such a continuous policy would be impossible unless the local authorities can feel reasonable security that the finance required will be forthcoming over a period of years. The Federation understand that it is the intention of the Government that this security should be assured. At the same time repeated statements are made, both by local authorities and others, to the effect that, since the transfer of the balance of the fund in 1926, continuous difficulties have been experienced by those seeking to obtain authority to proceed with schemes, even though these schemes may have been actually approved by the Ministry of Transport. The Federation are apprehensive that, unless some steps are taken to remedy this state of affairs, there may be serious interference with the development of our road system.

FORTHCOMING ENGAGEMENTS.

[*Secretaries of Gas and Kindred Organizations are asked to assist in making this diary of events as complete and useful as possible by sending the earliest intimation of all meetings.*]

July 22.—MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.—Meeting at Wentworth Woodhouse. Visit to the works of the South Yorkshire Chemical Company. Lunch at the invitation of the Right Hon. The Earl Fitzwilliam, K.C.V.O., C.B.E., D.S.O.

Aug. 16-17.—IRISH ASSOCIATION OF GAS MANAGERS.—Annual Meeting at Cork.

Sept. 7-9.—NORTH BRITISH ASSOCIATION OF GAS MANAGERS.—Annual general meeting in Dumfries.

Sept. 13.—NATIONAL GAS COUNCIL.—Meeting of Central Executive Board.

Sept. 13.—FEDERATION OF GAS EMPLOYERS.—Meeting.

Sept. 22.—WALES AND MONMOUTHSHIRE DISTRICT INSTITUTION.—Meeting at Porthcawl.

Sept. 23.—SOUTHERN ASSOCIATION OF GAS ENGINEERS AND MANAGERS.—Visit to the Torquay Works of the Torquay and Paignton Gas Company.

Sept. 30.—EASTERN COUNTIES GAS MANAGERS' ASSOCIATION.—Annual meeting at Cambridge.

Oct. 3-5.—BRITISH COMMERCIAL GAS ASSOCIATION.—Sixteenth annual general meeting and conference at Southampton.

INSTITUTION OF GAS ENGINEERS.

July 26.—Education Committee Conference.

Sept. 12.—Finance Committee.

Sept. 12.—Council meeting.

Sept. 12.—Visit to the Shipping Engineering and Machinery Exhibition at Olympia.

Sept. 13.—Education Committee.

Moving a Live Gas Main.

In the "American Gas Association Monthly," Mr. David L. Meyer, of the Harrisburg (Pa.) Gas Company, recounts the moving of a live gas main. It appears that, in order to make way for a new bridge over the Susquehanna River, it was necessary to move the old girder bridge 16 ft. down stream, on to a temporary trestle. The bridge carries a 4-in. high-pressure steel gas main supplying ten boroughs and villages; and as the bridge was shifted to its new position without interrupting vehicular traffic, it was necessary to provide some kind of flexible connection at each end of the main so as to follow the progress of the work. This was done by hooking-up the main at either end with a 25-ft. length of fire hose, provided with suitable connections. Right-angle bends were attached at the ends when the main was cut, and connected to the hose with couplings. The hose was connected to the vertical leg of these bends and allowed to hang below the bridge. Trouble was experienced at one end due to the hose kinking; but this was overcome by suspending the loop of the hose in a wooden cradle. After the ends had moved about 5 ft. apart, the cradle was unnecessary. As the moving progressed, the couplings were loosened, and the vertical legs turned towards each other to avoid sharp bends at the connecting points between the vertical legs and the hose. The gas connections worked satisfactorily. After the bridge was landed in its new position, the main was connected again with steel pipe.

ELECTRICITY SUPPLY MEMORANDA.

Innocence or Deliberate Misleading?

"METEOR" of the "Electrical Times" is incorrigible. We have illustrated on previous occasions how ignorant he has succeeded in proving himself when dealing with gas matters, and how extravagant he can be in his statements concerning gas. In two paragraphs in the issue of his journal for June 30—one headed "Why Gas Stoves Cause Headaches," and the other "Big Percentage of CO Inhaled"—we have examples of his writing which reveal a total want of knowledge of what he is attempting to criticize, or a crude endeavour to mislead, which may succeed where information is not of a higher standard than that possessed by "Meteor." But men who understand these matters will smile over his efforts; others, soft-hearted, will express sympathy for a man who tries to do a rival injury in such a clumsy fashion as is exhibited in the paragraphs in question. In the first place, we would ask electrical readers of the "Memoranda" to peruse the first editorial in last week's issue of the "JOURNAL." What was there said will give an indication regarding the proper interpretation of the data given in the Seventeenth Report of the Gas Investigation Committee, which was presented at the recent annual meeting of the Institution of Gas Engineers. From this, "Meteor"—unsportsmanlike, and very stupidly—has extracted some of the worst figures, deliberately obtained under the worst conditions with a veteran gas fire. The critic will probably admit that the gas industry, having made research on the thermal side, should institute a careful investigation of the products of combustion, with special attention to carbon monoxide. He will also admit, even if he has not the intelligence to appreciate it without having it specially indicated to him, that it is right on such investigations that tests should be made, for comparison purposes, of both old and new types of gas fires under various conditions of adjustment and mal-adjustment; and he will probably agree (now that it is pointed out) that the gas industry does not show much fear when it presents to the whole world the results in such lavish detail.

Satisfactory Position of the Modern Gas Fire.

From a report of such a character, it is plainly possible to quote figures which are altogether abnormal, being the results of abnormal conditions; and it is equally possible to use such figures for the purpose of leading, or rather misleading, to a conclusion completely at variance with the real facts established by the report. This is the well-worn, downhill path followed by "Meteor." It may be a surprise to those whose knowledge of this investigation is limited to "Meteor's" comments upon it (1) that, in order to get reliable quantitative results for the determination of carbon monoxide in the chimney gases from the gas-fire many months had to be given up to working out the detail of a method capable of dealing with the small quantities involved; (2) that the satisfactory position of the modern gas-fire in respect of carbon monoxide production was established by a very large number of determinations. The principle of attaching a gas-fire to a flue, so securing complete evacuation of all products of combustion, and at the same time enabling the fire to ventilate a room effectively as well as to heat it, is established as sound, and in practice is generally adopted.

Results from an Ancient Fire.

Now let us more particularly examine "Meteor's" points. The first one is:

> A tabular statement of the results of careful tests shows that the parts of carbon monoxide produced per 10,000 of gas burned may be anything from 8·4 up to 599. It is the test on group No. 7, which is referred to as "Gas Fire B, with type B Radiants and Cross-Pieces," which shows this high percentage of parts of CO produced per 10,000 of gas burned, and eleven tests were made in this group. Only in one case did the CO figure fall to 23·8, and in seven of the cases it reached from 272 to 599 parts.

The first comment to be made upon this is that, in selecting group 7, the gallant "Meteor" has taken the fire, radiants, and cross pieces, which are seventeen years old, and do not represent the modern fire, and, moreover, it was tested under conditions from normal to abnormal. We leave "Meteor's" action to the judgment of his electrical friends. But now will he do his readers a favour by engaging in a little arithmetic, and telling them how much the parts of CO he has quoted per 10,000 parts of gas consumed represent in the volume of products of combustion emanating from the bunsen flames, also what they represent in the flue flow (including the air drawn up the flue, and ventilating the room), and what they would represent if all ejected into the air of a room of given dimensions?

The Pitfalls of Ignorance.

The second of "Meteor's" paragraphs is really funny. We hardly like to take advantage of the want of knowledge which it betrays. Let us put two statements from it side by side. They will amuse chemical readers.

If the housewife or cook, in stirring her saucepans, pores closely over the stove for a few minutes, it seems to us that at times she may be inhaling a mixture of air and spent gases which may contain an extremely dangerous percentage of carbon monoxide. The 6 p.ct. of CO contained in the gas burned is by no means a maximum possible; there are probably much worse stoves than that.	Our office text-book on chemistry informs us that even small traces of CO in the air cause indisposition. J. W. Mellor, D.Sc., in his big "Comprehensive Treatise on Inorganic and Theoretical Chemistry" says: "Any quantity above 0·14 p.ct. of carbon monoxide in the air is dangerous, and 0·4 p.ct. will nearly always cause death."

"Meteor" gives himself away in the passage: "The 6 p.ct. of CO contained *in the gas burned* is by no means a maximum possible; there are probably much worse *stoves* than that." The CO content of the gas burned has nothing whatever to do with the quantity of CO in the products of combustion when, for instance, the flame is broken by the insertion of a radiant in it. CO in gas is an excellent heating agent. The amount of CO produced in the circumstances per 10,000 parts of gas consumed has no relation to what that percentage would bear (if allowed to escape) to the air in a room of any given capacity. It is an appalling vista which presents itself to the imagination of "Meteor"—a population of housewives breathing an atmosphere containing 6 p.ct. of carbon monoxide, while "0·4 p.ct. will nearly always cause death!" It would be taking the joke too far, to recommend "Meteor's" point for investigation. There are upwards of 8 million gas-cooking stoves in use in this country, *plus* uncounted boiling-rings; they are used several times a day; they are not the same appliance as a gas-fire, and a gas-fire is a safer appliance in respect of CO than a coal fire. The country's health and death statistics show improvement all round; and gas heating has largely contributed to the better state of living conditions. According to "Meteor's" misconceptions, practically all the housewives of the country ought to be dead. Why are they alive? "Meteor" may think it strange, but it is true, that we should have no hesitation in having a higher percentage of CO in the products of combustion of a gas-fire if it would increase the thermal efficiency of the fire itself.

Contractors and Showrooms.

Among the subjects discussed at the annual conference of the Electrical Contractors' Association at Scarborough was that of electrical showrooms, which Mr. H. F. Walker dealt with in an attractive paper. He opened his argument by submitting that cheap electricity has priority over cheap installation and appliances, though, of course, he admits that all three items should be as cheap as possible. His point, however, is that the installation and the appliances are paid for once (until they have to be renewed), while payments for current are continuous. So looked at, there is something in the contention; but the real cheapness of any agent depends partly upon its cost in relation to value (in this case value being heat), and partly upon the efficiency with which the agent can be utilized. It so happens that heat is dear when provided electrically; and, no matter how efficient the appliances are, the cost of heat provided through them will always be expensive. Mr. Walker's main submission is that municipal authorities ought not, as against contractors, to set-up installation or competitive sales departments; and he thinks that all expenditure in this direction could be better devoted to supplying energy at the lowest possible prices. In reply, one might argue that, in order to get energy at the lowest possible price, its consumption has to be developed; and this can only be done by the connection of new appliances. Mr. Walker has no objection to local authorities having showrooms and demonstration departments; but he would like to draw the line there, and not to permit such displays to be converted into competitive sales organizations, thereby discouraging private enterprise. He thinks the electrical contractors are the proper persons to organize the increased number of retail electrical showrooms which will be called for as the industry develops. As ordinary traders, they are in daily touch with the public; and, in his view, it behoves them to establish that public contact on the broadest, most productive, and most instructive lines possible. This is all very well. Save in a few exceptional cases, the contractors hitherto have done little or nothing to stimulate demand for electrical appliances. That has been the great grievance of the municipal authorities; and, therefore, we cannot blame them for the action they took in persistently attempting to alter this condition of things. It is due to their activities that new life has been put into the

brains of the electrical contractors, and has made them more imaginative. We are under the impression that, while the municipal authorities will endeavour to work on the most favourable lines to promote mutual advantage, they are not likely to concede the ground which they have gained in connection with the promotion of development. There are a few gems in Mr. Walker's paper which are worth remembering—for example, "Public demonstration centres must be established if the electrical idea is to be driven home properly;" and "It is useless to have good premises and good stock if the human service is weak."

PERSONAL.

Mr. G. M. GLEDHILL, Acting Manager of the Driffield Urban District Council Gas-Works, has been appointed Manager.

Mr. D. R. SMITH, Resident Manager of the Epsom Works of the Wandsworth, Wimbledon, and Epsom District Gas Company, upon retiring after forty years' service, was presented by the employees with a mahogany clock. Mr. R. H. BUXTON will now be responsible for the Epsom Works, in addition to retaining his duties as Mechanical Engineer to the Company.

Following a recent presentation to Mr. CHARLES WOOD (lately retired Bradford City Gas Engineer and General Manager) by the staff of the Gas Department, a presentation was made on July 15 by the 900 employees at the Mill Street Works. In the former instance, in the enforced absence of Mr. Wood himself, the presentation was made through the persons of Mrs. Wood and Mr. Wood, Junior. In the case of the Mill Street presentation, a handsome cabinet gramophone was handed to Mrs. Wood by Mr. Tom French, one of the oldest employees.

At a meeting held in the mess-room at the Llandudno Gas-Works on Saturday last—Mr. W. Wilson (Works Foreman) in the chair—an eight-day oak dining-room clock, suitably inscribed, was presented to Mr. H. DUXBURY, the Engineer and Manager, on the occasion of his marriage; the presentation being made on behalf of the gas-works employees by Mr. H. Jones (Retort House Foreman), who is the oldest servant at the Llandudno Urban District Council Gas-Works. Mr. Duxbury, in returning thanks, said that the relations between the workmen and management during the time he had been at Llandudno had been most cordial; and he hoped they would continue to be so, because under such conditions the workmen and staff all gave of their best.

Mr. J. H. BREARLEY, M.Inst.C.E., has removed from Southport to "Dunremyn," 39, Leeds Road, Harrogate, at which address he will continue to carry on his consulting practice.

OBITUARY.

The interment of Mr. A. E. PODMORE, whose death was recorded in our columns last week, took place at Norwood Cemetery on the 12th inst. Among his professional friends present at the last ceremonies were brethren from the St. Martin's Lodge (of which the deceased was a well-known member), including the Worshipful Master, Mr. J. E. Henwood. The firm of A. E. Podmore & Co. was represented by Mr. B. Podmore and Mr. A. G. Swift. Among the personal friends present was Mr. W. J. Liberty, Hon. Secretary of the Institution of Public Lighting Engineers.

We are sorry to learn of the death of Mr. JOSEPH LISTER GODLEE, J.P., which occurred on July 17, at Wakes Colne Place, Essex. Mr. Godlee, who was 79 years of age, joined the Board of the old West Ham Gas Company in 1874, and was Chairman at the time of the amalgamation of that undertaking with the Gas Light and Coke Company in 1909. He then became a Director of the Gas Light and Coke Company, and was appointed Deputy-Governor in 1921. Some months ago he resigned his Directorship, owing to ill-health. Mr. Godlee had thus, as Sir David Milne-Watson pointed out at the last meeting of shareholders (when announcing the regret of his colleagues and himself at the resignation), been a Director of Gas Companies for over fifty years.

Natural Gas Supply of the United States.—Under an affiliation scheme, the Natural Gas Association of America is to become the Natural Gas Department of the American Gas Association. Investigation has shown that—with the exception of matters pertaining solely to the production of gas—practically all the problems in the natural gas industry are similar to those of the manufactured gas industry. The Natural Gas Association has been spending between $30,000 and $40,000 a year on its activities; whereas the American Gas Association is expending appropriations of upwards of $500,000 annually. According to statistics made public by the Geological Survey for 1924 (the latest available), the natural gas industry for that year produced 1,141,482,000,000 c.ft. of gas. Nearly 3,500,000 domestic customers consumed 285,000,000,000 c.ft., at an average price of 54c. per 1000 c.ft.; and 856,330,000,000 c.ft. were consumed by about 18,000 industrial customers, at an average price of 11·6c. per 1000 c.ft.

NATIONAL GAS COUNCIL.

Meeting of the Central Executive Board.

A Meeting of the Central Executive Board of the National Gas Council took place on July 12 at the Hotel Cecil, Strand, W.C.—Sir DAVID MILNE-WATSON, LL.D., D.L., in the chair.

MEMBERSHIP OF THE BOARD.

A communication from Mr. A. Caddick tendering his resignation as a member of the Board, owing to his retirement as Engineer of the Croydon Gas Company, was submitted; and it was decided that the thanks of the Board should be conveyed to Mr. Caddick for the valuable assistance which he had rendered to the Council for so many years past.

It was reported that Mr. John Terrace had been elected by the Institution of Gas Engineers as one of their four members on the Central Executive Board.

PRESIDENT.

It was unanimously decided to nominate Sir David Milne-Watson as President of the Council for the ensuing year.

NEW GAS LEGISLATION.

A communication was considered from the Secretary of the National Fuel and Power Committee asking that representatives of the Council should appear before the Committee on Thursday, July 14, in order to give a general explanation with regard to the statutory powers under which the gas industry operates at the present time, and the lines upon which the industry desired revision. It was explained that this interview would not constitute the final evidence which the Council would be required to give before the National Fuel and Power Committee, but was only of a preliminary character. It was decided that Mr. S. S. Ogilvie, accompanied by Mr. Thomas Hardie, should represent the Council before the Committee on Thursday, July 14.

WORLD POWER CONFERENCE.

Mr. H. D. Madden, President of the Institution of Gas Engineers, and Alderman J. H. Lloyd (Chairman of the Gas Committee of the Birmingham Corporation) were nominated to represent the gas industry on the Fuel Conference Committee. The conference will be held in London from Sept. 24 to Oct. 6, 1928.

REPORT OF THE LIQUOR EFFLUENTS RESEARCH COMMITTEE.

The attention of technical representatives of gas undertakings was particularly drawn to the Council's Monthly Report for May, which contains a copy of this report. [See "JOURNAL" for July 13 and 20.]

The Board sanctioned a further payment to the Institution towards the valuable work upon which they are engaged in this connection.

NATIONAL ILLUMINATION COMMITTEE OF GREAT BRITAIN.

It was decided to ask Mr. Robert Watson, of Doncaster, to represent the National Gas Council on this Committee, in order that the views of the Council might be expressed at international and other meetings of the Committee.

BRITISH ROAD TAR ASSOCIATION.

It was explained that the previous draft constitution which had been submitted to the Board had been withdrawn, and that in the draft now before the Board, instead of setting-up a Coke Oven Tar Producers' Board and a Gas Tar Producers' Board, it was now proposed that members of the Association should be individual gas and coke oven undertakings. The basis of the subscription, however, was to be the same as previously provided for—viz., 3d. per ton on the production of crude tar.

It was also suggested that for the first year the work of the Association should be undertaken by a nominated Council, which would satisfy the different interests concerned—viz.: Gas tar producers, coke oven tar producers, distillers, and the co-operative groups. This would enable the Managing Council, as a result of the experience gained, to review the position at the end of the first twelve months, and if thought fit to submit any amendments to the constitution to a general meeting of the Association.

The Board made certain further amendments to the draft constitution, to endeavour to provide that districts which produced large quantities of tar should have adequate representation. The Board adopted the constitution as amended.

DATE OF NEXT MEETING.

It was decided that the next meeting of the Board should take place on Tuesday, Sept. 13.

The Thomas Meter.—The Cambridge Scientific Instrument Company, Ltd., 45, Grosvenor Place, S.W. 1, have published an illustrated booklet describing in detail the Thomas recording gas meter. The booklet also includes an account of how the firm test the meters they manufacture.

THE GAS INDUSTRY AND LOW-TEMPERATURE CARBONIZATION.

Commercial Trial at the Works of the Gas Light and Coke Company.

The Report of the Fuel Research Board for 1926, together with the Report of the Director of Fuel Research (Dr. C. H. Lander) has been published by H.M. Stationery Office (Adastral House, Kingsway, W.C. 2; price 1s. 3d. net). In it the subject of low-temperature carbonization is discussed at length, both by Sir Richard T. Threlfall, K.B.E., F.R.S., who is Chairman of the Board, and by Dr. Lander. In view of the fact that a system of low-temperature carbonization is to be tried-out at the Richmond Works of the Gas Light and Coke Company, that section of the report referring to this matter is of more than usual interest to the gas industry.

EXTRACT FROM SIR RICHARD THRELFALL'S REPORT.

The question of the low-temperature carbonization of coal has been before the Board from its inception, as being a possible means of so treating coal as to obtain at once a source of oil fuel and motor spirit and a solid smokeless fuel that can be burned in any domestic grate. The technical difficulties have been largely overcome, and several processes have been devised which yield oil-producing tar, a rich gas, and a good lump smokeless fuel; others, producing the solid fuel largely in the form of breeze, may give a greater yield of tar. The difficulty has been, and is, to devise a method that can be worked so cheaply that it will be commercially possible to carbonize the whole, or a large portion, of the 40 million tons of coal now burned yearly in the raw state for domestic purposes, bearing in mind that this coal is one of the most highly priced products of our mines.

It has been possible to continue the work on the full-sized cast-iron retorts at the Fuel Research Station during 1926 without interruption. A preliminary report on the work has been published as Technical Paper No. 17.

In view of the considerable progress made both at the Fuel Research Station and elsewhere, much consideration has been given to the best method of carrying any suitable process to the final stage of its development—namely, a test under strictly commercial conditions, and on a commercial scale, extending over several years. Those processes which produce the largest proportion of lump coke suitable for domestic use also produce considerable quantities of rich gas which form a valuable portion of the products of carbonization. If such a process were to be adopted throughout the country, very large quantities of gas would be produced, the full value of which could only be realized with the co-operation of the gas undertakings. It was accordingly decided by the Government, with the concurrence of the Fuel Research Board, that Sir David Milne-Watson, the Governor of the Gas Light and Coke Company and the President of the National Gas Council, should be asked for his assistance in this matter. Questions of commercial development are somewhat outside the scope of the Department of Scientific and Industrial Research; and it was accordingly decided that the matter should be handled by the Mines Department, with the Department of Scientific and Industrial Research as technical advisers. Sir David Milne-Watson was seen by representatives of the two Departments, and asked whether he was prepared to consider all existing processes in detail and would advise the Government—

(*a*) Whether, in his opinion, any of these processes had reached such a point of development that it was worth while for his Company to continue the experimental development on a large scale.

(*b*) If so, whether he considered the selected process or processes sufficiently promising to justify his Company in taking the entire risk of this development.

(*c*) If not, whether he would submit a scheme after discussion whereby the Government would be asked to bear a part of the risk involved.

Sir David agreed to go into the matter; and after he had received reports from his staff after examination of all the processes being developed both in this country and on the Continent, he reported that he considered the one developed at the Fuel Research Station was the most promising for development in conjunction with a gas-works. He did not consider that any process was so far proved as to justify his Company in taking the whole risk of its development; but he was so far impressed with the desirability of co-operating with the Government by putting the matter to a practical test as to offer a site for a 100-ton a day plant, and to undertake to erect the plant and run it as continuously as is reasonably practicable for a period of three years, and to carry out experiments and researches in connection with the carbonization of coal, provided that the Government would pay the original cost of providing and erecting the new plant necessary on the selected site, which already had many of the requisite conveniences.

THE FUEL PRODUCTION COMPANY, LTD.

It was finally arranged that a subsidiary Company should be formed, termed the "Fuel Production Company, Ltd.," the capital of which has been guaranteed under the Trades Facilities Act. The Gas Company will act as managers for the Fuel Company, and will bear all running and management costs. At the end of 1930 the Gas Company have an option to purchase the plant, or if they do not wish to do this they will clear the site and dispose of the plant, &c., on behalf of the Fuel Company. Details of the plant are now being worked out, and it is hoped that it will be at work during next winter.

It has been agreed that the Company shall keep full records of experiments and all statistics necessary to demonstrate the results obtained, and to keep proper accounts in connection with the business of the Fuel Company. The Mines Department have the right to inspect the accounts, and the Research Department have the right to inspect the plant, its working, and all technical records. Steps have been taken to safeguard the public interest in any patents that may be taken out as the result of working the plant, and full details of the plant and the results obtained will eventually be published and be freely at the disposal of any company desirous of working the process. Thus it will be seen that the Gas Light and Coke Company are in effect carrying out the work for the benefit of the whole industry.

This arrangement should provide definite information as to the commercial possibilities of the process.

It should, perhaps, be emphasized here that the Fuel Research Station retort was considered the most suitable type for trial in conjunction with a London gas-works; and it does not follow that there are not other types, some of which, while possibly unsuited for gas-works, may be equally or better suited for use under other conditions—*e.g.*, for erection at power stations, or at the collieries for the treatment of special types of coal.

No further tests of outside plants have been carried out during the year, but reports by the Director on two tests carried out during 1925 have been published.

While we welcome the action taken to test the Research Station plant on a commercial scale, we realize that similar trials of other plants and in other circumstances are required in addition; and we welcome the efforts being made in this direction elsewhere.

DR. LANDER'S VIEWS ON LOW-TEMPERATURE CARBONIZATION.

It is undoubted that any low-temperature carbonization process must be proved a commercial success before it will be widely adopted. The Royal Commission on the Coal Industry (1925) paid considerable attention to this matter, which was brought prominently to their notice, and took evidence from various independent workers on the subject. In their report they state: "We have given close attention to the question of low-temperature carbonization, but can find no evidence that the system has yet been anywhere established on a commercial scale for a period sufficiently long to enable the claims made on its behalf to be fully tested." This statement naturally prompts questions as to how near we are to a practical process, and what progress has been made in recent years.

FOUR STAGES OF DEVELOPMENT.

It may be said at once that distinct progress has been made, both at H.M. Fuel Research Station and by private workers; but it is still impossible to answer the first question, beyond saying that it must necessarily be several, and probably many, years before any appreciable fraction of the 140 or so million tons of coal burned in the raw state in this country each year is treated by this method. That this is inevitable will be shown by a consideration of the stages through which any process of this type must necessarily pass before it is adopted on a large scale. These stages may be stated as follows:

(1) The suggested method must be investigated under laboratory conditions where the varying factors involved can be subjected to close control and where relatively high accuracy of measurement can be obtained.

(2) The process must then be carried a stage further by erecting an intermediate scale unit with a view to obtaining further designing data for a still larger unit. In this stage the plant will probably deal with several hundredweights a day.

(3) Making use of the information yielded in stage 2, a full-scale unit must now be erected and tried-out. The size of this unit would depend upon the type of plant, but might range between (say) 5 tons and 100 tons daily capacity. It is essential that this unit should be capable of multiplication to the full size of commercial unit without any alteration in scale.

(4) A commercial battery consisting of several units similar to those developed in stage 3 would then be erected in some favourable locality, and the economic possibilities of the system examined in actual practice, and, if necessary, tested by actual commercial audit.

Though each stage will provide data to guide the designer towards successful accomplishment in the next, it will not provide anything like complete information; and it is to be expected that several designs will be tried, and found wanting, during the progress through stages 2 and 3. The end of stage 3 should prove the technical success of the process, and give some idea of the commercial possibilities; but only at the end of stage 4 can a process be said to have been proved. The penalty of proceeding to a higher stage before the completion of the preceding one is almost invariably not only a financial loss, but a general, and possibly undeserved, discrediting of the method. The histories of the early stages of coal gas manufacture and of low-temperature carbonization provide, unfortunately, many illustrations of this truth.

There are probably about two hundred methods of low-temperature carbonization which have been suggested, and more or less proved, at any rate to the satisfaction of their sponsors, so far as stage 1. There are a few being developed on sound lines, most of which have reached the end of stage 2; five or six are approaching the end of stage 3; two or three are in stage 4; but no one has yet reached the end of stage 4, where audited figures can be produced to show that actual profits have been made under normal working conditions. In every case where an attempt has been made to omit one of the stages enumerated above, the result has been disaster.

No "Best" Process.

It must be emphasized again that it is extremely unlikely that any one system of low-temperature carbonization will ever be adopted to the exclusion of other systems. The type of plant to be adopted in any given case will depend on the object aimed at, and the raw material available. The problem of producing a free-burning lump coke, which will replace raw coal for domestic purposes, is different from that of recovering oil-producing tars from special material such as cannel coal, or again from that of producing coke breeze, or pulverized coke, for use under boilers. The use that can be made of the gas, and hence its commercial value, will depend on local circumstances as well as on the quality of the gas; this again will have a bearing on the most suitable type of plant to adopt.

It has been claimed that by low-temperature carbonization a low-grade cheap coal can be so treated as to yield a higher-grade and higher-priced solid fuel as well as valuable bye-products; and, in some cases, this would appear to be true. The economic results to be expected will, however, depend on the reasons for the cheapness of the coal. In some parts of the world, such as Germany, Canada, and Australia, there occur large deposits of brown coal, which is a low-grade fuel, but which often occurs in thick deposits workable by open-cast methods at a very low cost. In such a case, any fuel produced by carbonization would compete with higher grade, and more expensive, fuels produced elsewhere; and an increase in the demand for the product would not increase, and might decrease, the cost of mining the brown coal.

Low-Grade Slacks in this Country.

In this country the production of low-grade slacks is incidental to the production of the more valuable coals, of which they originally formed a part, and they cost as much to mine as the higher-priced coals. The average selling price must cover the average mining cost, so that the loss on the low-grade slacks must be covered by the higher selling price of the higher-grade product. If a process be developed for the manufacture from the slacks of a low-temperature product which competes with the high-grade coal, the demand for the latter will be reduced, and the margin of profit on its sale will also be reduced. If the process be adopted on a really large scale, the profits on the high-grade coal will no longer be sufficient to meet the losses on the low-grade, the price of which will therefore rise. This process will continue until a new economic balance is obtained; and the general result will be a cheapening of the high-grade fuel, but an increase of price of the low-grade. The net result should be a gain both to the mining industry and to the country generally; but the difference in price between the untreated low-grade raw material and the higher-grade fuel produced from it will be much less than in the cases of the broken coals mentioned above. There is thus less margin available for working expenses, so that a carbonization process that would pay handsomely in the one case might be impracticable in the other.

It is important to distinguish between low grade and low quality. Brown coal, and slack or fines, of small ash content, are low grade but good quality, and, if otherwise suitable, will give a coke of good quality. A slack of high ash content would be a raw material of inferior quality, and would give a coke of high ash content and reduced value. In attempting to create a market for a new product, it is very important not to create a prejudice by supplying a material of poorer quality than its competitors; it should rather be superior.

Magnitude of the Task.

It is well also to realize the magnitude of the task of developing fuel treatment to the point where smoke production from domestic chimneys is entirely eliminated. The replacement of 30 or 40 million tons of raw coal now burned annually in domestic grates, by coke produced by low-temperature carbonization, will involve the starting of a new industry comparable in size with the existing carbonization industries. The carbonization of 40 million tons of coal would result in the production of some 30 million tons of semi-coke, some 600 million gallons of tar, and some 1200 million therms of gas of high-calorific value, together with some 60 million gallons of crude light spirit which can be obtained by scrubbing the gas. This spirit has a very high benzole equivalent. Against these figures must be set the fuel required for heating the retorts, which may be obtained from the coke, tar, or gas, or from low-grade coal, whichever is the cheaper in the circumstances of each plant. These figures are rough approximations, and are only given to show the magnitude of the problem involved. The cost of the plant for this purpose would amount to at least £60,000,000, not including any plant for the treatment of the crude products. The gas made would considerably exceed the total at present made by the gas undertakings, from which it follows that the co-operation of the gas undertakings will be essential for the development of low-temperature carbonization on a national scale. If the whole of the coal (140 million tons) at present burned in this country in the raw state were to be carbonized, the above figures would have to be multiplied by 3½.

Type of Plant to be Tried-Out at Richmond.

The construction of the retorts is shown in the drawing. They are 21 ft. high by 6 ft. 6 in. by 7 in., widening to 6 ft. 10 in. by 11 in. They are made of ordinary grey cast-iron of good quality, and are divided into three sections, which are cast in halves. The metal is 1 in. thick, and strengthening ribs project as far as the edge of the flanges along each side of the retort. The general construction is shown in the drawing. The extractor gear consists of a curved grid or comb, which supports the charge at the base of the retort. This design was adopted after discussions with the Woodall-Duckham Company, and certain of its features are embodied in patent No. 251,043 of that firm. A set of arms passing between the teeth of the comb pushes the coke off them. A rush of coke is prevented by weighted bars suspended so as to rest against the ends of the teeth, as shown in the diagram. Arrangements are made to allow of rodding vertically up through the teeth of the extractor gear and also horizontally in a position above the teeth.

As originally designed, it was intended that the extractor gear should be worked continuously, and therefore the coke chamber below the extractor gear was divided by a door; the intention being that when the door was closed the coke below it should cool off for a period of (say) 1½ hours while the hot coke was collecting above the door. When the cooled coke had been discharged, the hot coke would be allowed to fall into the lower chamber to cool, and the upper door again be closed. In actual practice it has been found more satisfactory to operate the extractor gear for a short time only, at intervals of one, two, or three hours, according to the nature of the coal undergoing carbonization. Consequently, the inner door of the coke chamber is not used.

Steam can be admitted to the coke chamber immediately above the doors. With the use of steam so admitted there are indications of an increased yield of tar; but beyond sealing the retort from inrush of air, the exact function of the steam is uncertain. The matter is under investigation.

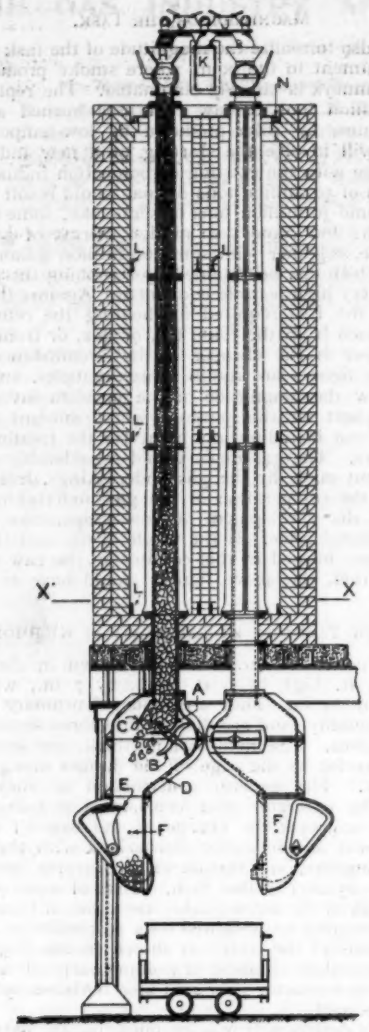
Above the heated zone there is a short casting 18 in. high, of the same general dimensions as the upper portion of the retort, from which the offtakes ascend, and in the cover of which are six rodding holes and the coal-supply valve. This casting is not shown in the diagram, as it is being removed and the cover of the retort placed immediately on the top of the heated zone. This step has been decided on in order to obviate as far as possible the condensation of the tar vapours on the cold coal entering the retort.

Various systems for admitting coal to the retorts have been tried. The system at present in use is the most satisfactory so far—that is to say, one feed valve in the centre of the cover of the retort; the valve itself being as close as possible to the heated zone.

Two gas offtakes are arranged one on each side of the major diameter of the retort; and these discharge into the top of the collecting main with as short a connection as possible. Arrangements are made for continuous circulation of liquor through the collecting main, which may be kept wet or dry as required.

Heating the Retorts.

The heating is arranged on a system which at the Fuel Research Station has been found particularly successful—namely, the fuel gas is led by means of plain steel pipes bent vertically upwards at the end into various corners built into the internal face of the setting. It has been found that the chimney effect of the corner enables the flame and hot gases



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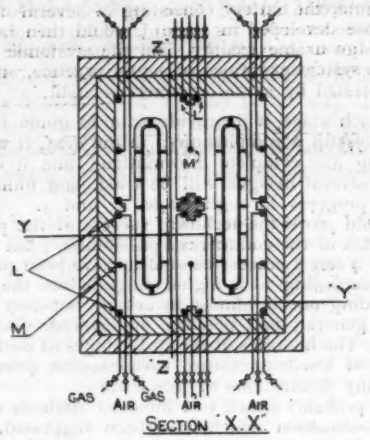

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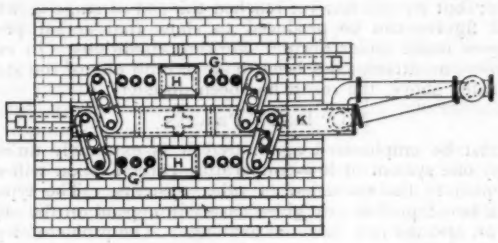


PLAN

Setting of Cast-Iron Retorts for Low-Temperature Carbonization H.M. Fuel Research Station, Greenwich.

[Published by permission of the Controller of H M. Stationery Office, from the Report of the Fuel Research Board for 1926.]

Extractor Gear:
A—Curved Grid or Comb.
B—Revolving Set of Arms.
C—Suspended Weighted Bars.

Coke Chamber:
D—Rodding Holes.
E—Dividing Door.
F—Point of Steam Admission.

Retort Cover:
G—Rodding Holes.
H—Coal-Feed Valve.
J—Gas-Offtakes.

K—Collecting Main.
L—Fuel-Gas Burners.
M—Air-Supply Pipes
N—Sand Seal.

to cling closely into the corner and not to wander; and thus contact with the retort walls is avoided. The heat from the flame is conducted along the brickwork, so that the retorts are heated very largely by radiation from the flame and brickwork. It appears certain also that the waste gases must heat the retorts by convection during circulation inside the setting before leaving the chamber after their first passage direct to the top. There are three sets of this type of burner, dividing the vertical height of the retorts into three portions.

The air supply is led to intermediate positions between the burners at each level; the idea being to retard the rate of combustion of the gas and to lengthen the flame. In the top position the air supply discharges close to the burners, so as to shorten the flames.

The number of burners at each level is 16, and the number of entrances for the air for each set of burners is 6. Half-way along each side of the setting a 4½-in. vertical projection of brickwork is built. One gas burner is placed in each corner of the setting, and one in each corner made by the projecting brickwork. This leaves the centre of the setting unheated, and there it is necessary to build a cross from the floor upwards, to give four more corners into which the burners may be placed.

Apart from such support as is necessary for the gas and air pipes, which are 1-in. and 1½-in. steel tubes respectively, the inside of the setting is perfectly plain from top to bottom, and contains no obstructions to the upward passage of the gases.

The combustion chamber is closed in at the top by a steel plate, which is made gastight by a special sand seal, which allows of expansion or growth of the retorts to the extent of 6 in. The seal plate is covered over by 3 in. of non-conducting brick and a further 3 in. of sand.

The flue gas offtakes lead from the centre of the seal plate into one 8-in. pipe (not as shown diagrammatically herewith), which passes away through the roof, rising 21 ft. above the top of the setting. The pull thus exerted on the setting is sufficient to draw-in the air required for complete combustion of the heating gas.

CHOICE OF COALS.

It was at first considered that the most suitable coal to use in these retorts would be either a medium caking coal or a blend of caking and non-caking coals. It would appear, however, possible to use almost any type of coal, provided a suitable method of working be adopted; and the method which has proved successful is a compromise between continuous and intermittent. The extractor gear is worked for a short time at intervals of from 1 to 3 hours; the charge in the retort being lowered 3 to 6 ft. or more each time, after which coal is run in and the charge left undisturbed until the next charging period. Different coals require different periods of quiescence, during which the coal passes through the plastic stage, and after which the charge will drop with little or no attention from the poker. This method of working overcomes difficulties due to a caking coal hanging up in the retort, and reduces the quantity of coke breeze formed as compared with continuous working. It is far less trying to the metal of the retort than intermittent working, as it prevents the variations in the temperature of the retort which are almost inevitable when it is completely emptied and then refilled with cold coal.

When working smoothly, the retorts are charged alternately, and it has been found that there is no necessity to alter the gas supply in any way. If, however, trouble is experienced with the coal in the retorts, then it is very convenient to be able to reduce the gas supply to the top section of the retort; that to the lower parts of the retort very seldom requires alteration.

The amount of fuel gas required may be judged by the following figures for operation on run-of-mine Durham coal without steam, at the rate of 2·7 tons per retort per day:

	Water Gas per Hour.
Lower set of burners	1050 c.ft.
Middle ,, ,, ,,	420 ,,
Upper ,, ,, ,,	1000 ,,

HEAT-RESISTING CAST IRON.

The question of providing a cast iron which will withstand a somewhat higher temperature than 625° C. has been in-

vestigated with the aid of Prof. H. C. H. Carpenter, and the co-operation of the British Cast Iron Research Association. On their advice an order has been placed for a retort of a rather different design as regards the ribbing provided for stiffening; and it is hoped this will allow somewhat higher temperatures to be used without serious distortion, or, at any rate, allow a margin of safety which will obviate the necessity for close temperature control.

Results of the working of these retorts were given in the "JOURNAL," Feb. 16, p. 389; March 30, p. 803.

MODERN METHODS OF COKE COOLING IN GAS-WORKS.

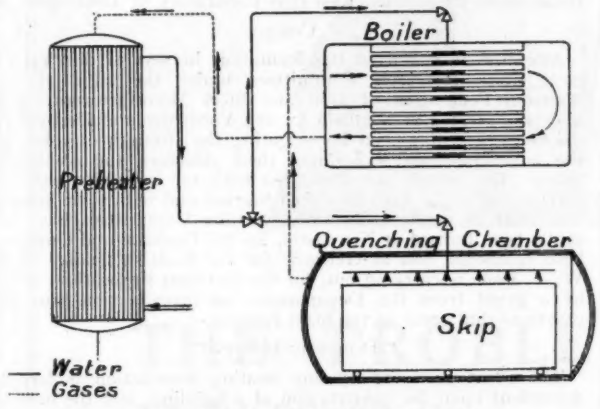
By PIERRE MOUGIN.—(*Concluded from p. 96.*)

COOLING WITH WATER GAS PRODUCTION: THE HELLER-BAMAG SYSTEM.

The firm of Sulzer was the first to contemplate the cooling of coke with an accompanying production of water gas; and in 1918 they took out a patent for spraying the red-hot coke in a gas-tight chamber, and burning the gases in the tubes of a boiler. The author, however, knows of no industrial application of this invention.

The most recent process of this nature is the Heller-Bamag which is characterized not only by the production of high-pressure steam, but by the generation of a considerable quantity of water gas. A commercial installation has been at work for more than a year at the Potsdam Gas-Works.

[Mr. J. P. Leather having devoted a section of his Institution paper to the same installation, we shall not reproduce M. Mougin's description thereof—beyond the diagram, which shows clearly the circulation of the water and the gases.]



Circulation Diagram of the Heller-Bamag Plant.

The water attains a temperature of 140° to 150° C. in the preheater, whence it is valved either to the boiler or to the spraying apparatus. On the commencement of spraying, the pressure rises rapidly, and attains 12 to 14 atmospheres after about a minute; and a relief valve after the preheater is set to maintain the required pressure in the plant. Spraying ceases when the pressure in the chamber itself begins to fall. The coke will then have absorbed a definite quantity of water; but its temperature—200° to 220° C.—is slightly above that which corresponds to the vapour pressure within the chamber. Before the skip of cooled coke is removed, the plant is purged by opening the above-mentioned relief valve, which also causes vaporization of the absorbed water, and brings down the temperature of the coke to 100° C.

It is found that this after-vaporization will account for a water-content of about 8 p.ct.; and this knowledge enables one to regulate with precision the final humidity of the coke. For instance, if a figure of 4 p.ct. is desired, the spraying is prolonged till it is reckoned from experience that 12 p.ct. has been absorbed. The actual quenching of the charge takes about 8 minutes; but the cycle is extended to 15 minutes by the operations of charging, discharging, purging, &c.

At Potsdam they produce 300 kg. of steam at a pressure of 8 kg. per tonne of coke [649·5 lbs. at 17·6 lbs. pressure per ton], and 40 cub.m. [1435 c.ft. per ton] of water gas of the following composition:

H_2	50 to 60 p.ct.
CH_4	1 ,, 3 ,,
H_2S	3 ,,
CO_2	12 ,,
N_2	0 to 1 ,,
CO	22 ,, 26 ,,

This gives a gross calorific value of about 2500 cal. per cub.m. [281 B.Th.U. per c.ft.].

At this point, the author again stresses the great improvement in coke quality by these modern processes which provide for slow and regular cooling and consequent absence of disintegration. He cannot produce figures to show that the Heller-Bamag is in advance of other methods in this regard; but he points out that it has one notable advantage—that it remains in the same skip from red-hot discharge to cool delivery.

The only available figures being in foreign currency, M. Mougin cannot submit a financial balance-sheet, but puts forward the following calculation for the thermal efficiency.

Available heat units between 1000° and 100° C.
= 1000 × 0·360 (1000 − 100) = 324,000 cal.
Recovered in steam at 7 kg. pressure
= 300 [606·5 + 0·305 (165 − 16)] . . . = 192,600 cal.
Latent heat of water gas
= 40 × 2500 . . . . . = 100,000 ,,
292,600 ,,

$$\text{Thermal efficiency} = \frac{292{,}600}{324{,}000} = 90 \text{ p.ct.}$$

This figure must not be accepted as attainable in practice; but undoubtedly a high efficiency is shown. Further, such evidence as is available seems to prove that a Heller-Bamag installation will amortize itself in one year.

CONCLUSIONS.

In commencing a summary of the main considerations involved, the author says it must not be forgotten that the problem of coke cooling has already been solved in a manner "much more elegant" than anything he has described—namely, the method incorporated in continuous vertical retorts; but horizontals, inclined chamber ovens, &c., are not being supplanted by verticals to such an extent as to mask the importance of his subject.

The main item which must be debited against the modern processes represents amortization; but the adopted designs seem to be very durable, and one need not reckon to write off the expenditure too quickly. Another item of some importance is motive power; but against this may be set the fact that practically no increase in labour is called for, except perhaps in the case of the Heller-Bamag system. Upkeep charges are likely to be less than would appear at first sight; one reason being that the skips can be made of specially resistive material, and in any event would not suffer as greatly as they do under a quenching spray.

First on the credit side must be placed the heat units recovered in the form of hot water, steam, or water gas; and while such conservation represents a definite victory in the "hunt for calories," the question must be asked: Is the best use always made of these heat units? The steam demands on a gas-works are not really great, and at times may fall short of the supply; and one must bear in mind the possibility of having to provide an accumulator, or of utilizing the surplus for central heating purposes.

The next item—improvement of coke quality—is of no less importance. In the first place there is a smaller proportion of fines and dust to dispose of; and secondly, the reduction of the water content will undoubtedly raise the status of gas coke in the market, and consequently alleviate to some extent the painful sacrifices that now have to be faced in times of glut.

A further advantage has to be found in the reduced handling necessary in these modern systems—there is less wastage through combustion. That this may be a serious item is exemplified by pointing out that in handling hot coke the loss by combustion amounts to 200 grammes per minute per 100 kg.; and in five minutes this amounts to 1 p.ct. loss. The saving in steam generation, the avoidance of corrosive fumes in the retort house, and the general improvement in working conditions, are further items on the credit side.

The author concludes by urging all undertakings, of whatever size, to look into the matter, for dry coke cooling is now a practical proposition, and there exists a diversity of methods to choose from.

Detection of H_2S in Gas.—"Chemicus," quoted in the "Gas Age-Record," says he has occasionally experienced cases of failure to detect H_2S in gas by the usual lead-paper method by reason of the fact that the service pipe leading to the test apparatus was constructed of iron, which, if very clean inside, will remove H_2S before it reaches the lead paper, if this constituent is present in traces only. When rust is present, much larger quantities of the impurity may be removed, due to the fact that the inside of the pipe will act as a purifier; the iron oxide removing the H_2S in exactly the same way as on the large scale at the gas-works. The point sometimes becomes a serious one, since the gas at the outlet of the purifier boxes may test pure when not actually so. The difficulty is overcome by having glass tubing connections to the test apparatus.

REPORT OF THE FUEL RESEARCH BOARD FOR 1926.

Excellent Year's Work in Spite of Difficulties.

[The question of low-temperature carbonization is discussed at length in the report, and forms the subject of an article entitled "The Gas Industry and Low-Temperature Carbonization," published on p. 162 of this week's "JOURNAL."]

The coal stoppage of 1926 naturally reacted on the large-scale work of the Fuel Research Board; but in spite of great difficulties thus caused, the Report for 1926 (published by H.M. Stationery Office, Adastral House, Kingsway, W.C. 2; price 1s. 3d. net) shows the enormous amount of work, covering a wide field, which the Board carried out during that year.

The Chairman of the Board, Sir Richard T. Threlfall, K.B.E., F.R.S., welcomes the appointment, as one result of the Report of the Royal Commission on the Coal Industry (1925), of the National Fuel and Power Committee, for he believes that the activities of this Committee should lead to national economies in the utilization of our fuel resources, and promote the co-operation of different industries to that end. For the same reason, he welcomes the action of the National Gas Council and the Institution of Electrical Engineers in setting-up a Joint Committee "to inquire into the possibility of closer co-operation between gas and electricity undertakings in promoting capital and fuel economy in the supply to the public of energy derived from coal."

The first section of the Report of the Director of Fuel Research, Dr. C. H. Lander, deals with the work of the Physical and Chemical Survey of the National Coal Resources, and it is mentioned that Mr. C. A. Seyler is further developing his method for the study of the structure of coal by the microscopical examination of an etched polished surface by reflected light. Dr. Lander then passes on to consider

WORK IN CONNECTION WITH THE GAS INDUSTRY.

He refers first of all to experiments with vertical retorts, and particularly to an investigation of the yields of gaseous, liquid, and solid products resulting from the carbonization of Mitchell Main gas nuts at nominal and double throughputs. The gas produced at the increased throughput is of higher calorific value, but the yield is less per ton of coal. The yields of tar and ammonia per ton of coal are increased; but he points out that, in view of the reduced yield of gaseous therms per ton of coal, it is improbable that carbonization at double the normal throughput would be economical at present, except in special circumstances.

With regard to the horizontal retorts, it is stated that a start has been made on a general investigation to determine the effect of the following on the results obtained: (i.) Nature and size of material; (ii.) size and distribution of charge; (iii.) method of heating; (iv.) temperature of carbonization; (v.) nature of mains, and arrangements of offtakes.

About 200 tons of the coke produced in the retorts described in the article entitled "The Gas Industry and Low-Temperature Carbonization," which is published in this week's "JOURNAL," p. 162, were sold to 180 different customers, and to each purchaser was issued a questionnaire as to its behaviour. From the replies received, it seems that the coke gave general satisfaction. It ignites and burns freely in all cases, and is suitable for use in open grates, hot water boilers, &c. It has been used with success at the Fuel Research Station in the water gas plant and under boilers, and with equal success in a series of road trials on a steam lorry.

With regard to briquetting, a systematic series of trials is being carried out with pitch (gas-works and low-temperature) and other binders, and an investigation is being made of the properties desirable in pitch for use as a binder. The Tar Distillers' Association are co-operating in this matter.

HYDROGENATION.

A Bergius plant has been erected at the Fuel Research Station. Continuously working, it is capable of treating about 1 ton of coal a day. In this plant the powdered coal is mixed, with the requisite amount of tar or oil and oxide, into a stiff paste, which is forced by a hydraulic press into the first of three reaction bombs, to which hydrogen is also supplied under pressure. The mixture passes through each bomb in turn, after which the products pass through a condenser and separator, whence the gas circulates through a second condenser and scrubber to a holder. The bombs are heated by a lead bath. The engineering problems involved in working at the temperatures and pressures required are considerable, but have been surmounted so far as the intermediate-scale plant is concerned. There is, states Dr. Lander, still much to be learnt as to which coals are most suited for the treatment, and as to the optimum conditions of temperature, pressure, and throughput for each coal. The new plant will be used for investigating these problems and methods of improving the process generally, as applied to British bituminous coals. The economic possibilities of the process are as yet unknown, the capital costs must be high, and much power is needed. The amount of hydrogen required is large (about 6 p.ct. by weight of the coal). The possibility of obtaining it from the gaseous products of the process is being investigated. Even if further knowledge proves that the process cannot produce liquid fuels to compete with imported natural oils at present prices, conditions may change; and it is of great importance to the country that full information should be available of any system by which it may be possible to produce liquid fuels in quantity from home sources.

Preliminary investigations in connection with the conversion of water gas into hydrocarbons are being carried out at the Fuel Research Station, and work is also proceeding at the Department's Chemical Research Laboratory at Teddington.

COKE.

Attention is called to the formation in several districts of local Coke Research Committees under the ægis of the National Federation of Iron and Steel Manufacturers. The first was formed at Sheffield for the Yorkshire and Derbyshire coalfields, and has been investigating the strength of cokes in the laboratory, and examining their structure and combustibility. The results are correlated with the reactivity tests as carried out at the Fuel Research Station and with their known behaviour in the blast furnace. Similar Committees have recently been formed at Newcastle, for the Durham and Cumberland coalfields, and at Glasgow for the Scottish fields. Prof. W. A. Bone is carrying out, for the National Federation, aided by a grant from the Department, an investigation into the reactions that occur in the blast furnace.

DOMESTIC HEATING.

The effect produced by any heating installation is largely dependent upon the construction of a building, and the outside weather conditions. A knowledge of the nature and magnitude of the heat interchanges associated with houses built of different materials and heated by different methods, and of their relation to meteorological conditions, is thus essential in the interests of fuel economy. Recognition of the importance of this question has resulted in a joint programme of work being prepared by the Building Research and Fuel Research Divisions of the Department; and an investigation of the entire problem has been undertaken. The inquiry is being carried out on the full scale at the Building Research Station in accommodation specially erected for the purpose, which, though suitably equipped for experimental work, closely resembles an ordinary small house of the artisan class.

Particular attention is being directed to the question of the relative efficiency of the ventilating effects induced by different flues and ventilators, and by various types of heating installations.

Progress was also made during the year with the equipment for research into the analysis of flue gas from coal and coke fires, and the heat losses represented by unburned soot and gaseous products of combustion.

The importance of defining the conditions which govern the satisfactory behaviour of coke for domestic fires, whether in sitting-room grates or kitchen ranges, and not only of distinguishing between the relative merits of cokes of different types for such uses, but of determining the designs of grates or ranges best suited to the use of a flameless fuel such as coke, has led to arrangements being made at the Fuel Research Station for carrying out a complete inquiry into these problems.

Wales and Monmouthshire District Institution.—The next general meeting of the Wales and Monmouthshire District Institution of Gas Engineers and Managers will take place at Porthcawl on Thursday, Sept. 22.

Drakes Vertical Retorts for Preston.—Drakes, Ltd., of Halifax, have received an order from the Preston Gas Company, of which Mr. Samuel Tagg, M.Inst.C.E., is the Engineer and Manager, for a Drakes vertical retort installation, consisting of 32 retorts, of a nominal capacity of a million c.ft. per diem. The order was secured in open competition, and is the first unit for the new works which the Preston Company are laying out at Lostock Hall.

Gas at the British Industries Fair, 1928.—Many important gas apparatus manufacturers are to show next year. Gas engines, cookers, stoves, water-heating apparatus and accessories, &c., have always formed a prominent feature of the Heavy Section of the Fair; and each year there have been magnificent municipal demonstrations of gas utilization. Last spring, for example, the gas consumed for demonstration purposes was 150,000 c.ft. a day—equal to the requirements of a small town. This is the first time, however, that commercial gas undertakings and important allied interests are to make a display on a large scale, forming a Gas Section comparable with that of the electricity industry.

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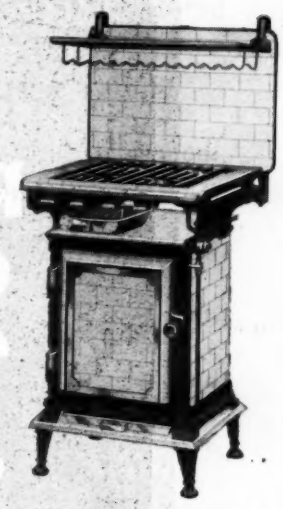

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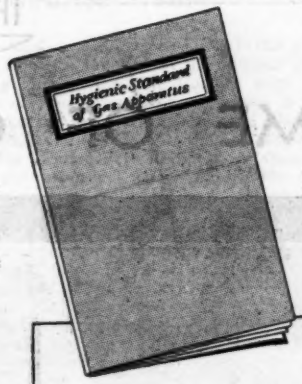

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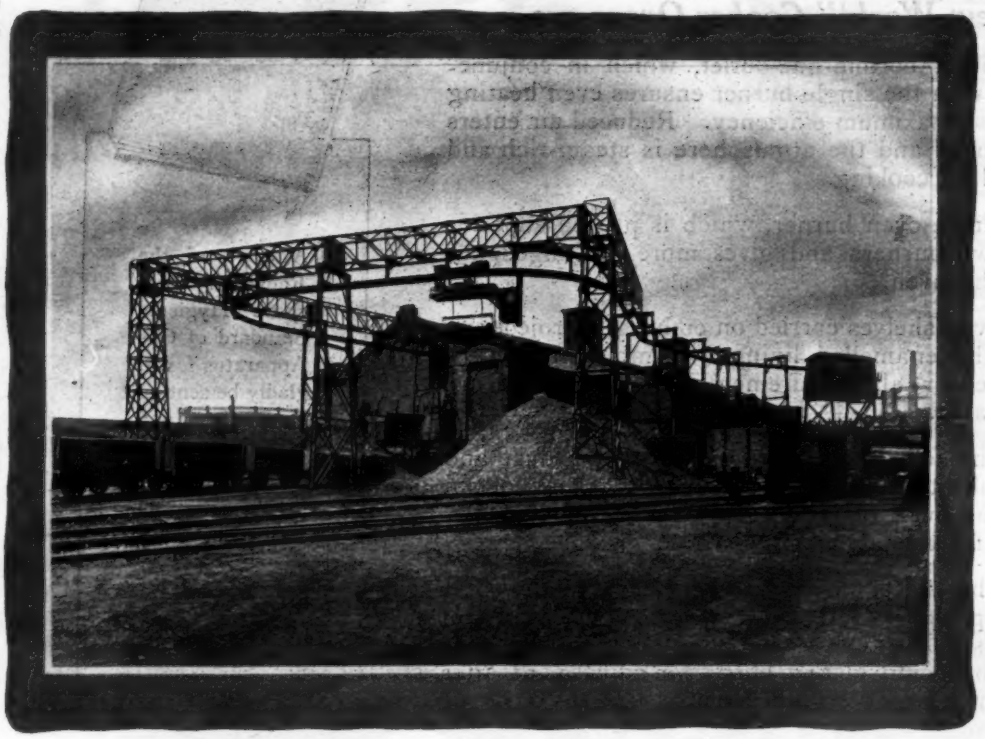

IN this Telpherage Plant for coke handling there is included a set of Coke Storage Hoppers and "Cascade" Screening Plant (seen in the distance), together with a Shelter for the Telpher Machine at the extreme end of the track.

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NATIONAL GAS COUNCIL OF GREAT BRITAIN AND IRELAND.

NINTH ANNUAL GENERAL MEETING.

There was a large attendance at the Ninth Annual General Meeting of the National Gas Council, which was held on Tuesday afternoon of last week, at the Hotel Cecil, Strand, W.C. The chair was occupied by Sir DAVID MILNE-WATSON, LL.D., D.L. (the President), who dealt, in his address, with several important matters.

At the opening of the proceedings, the minutes of the eighth annual general meeting, which had been circulated, were taken as read, confirmed, and signed.

MEMBERS OF THE CENTRAL EXECUTIVE BOARD REPRESENTING DISTRICT EXECUTIVE BOARDS AND ASSOCIATED BODIES.

The SECRETARY (Mr. W. J. Smith) reported the following list of members of the Central Executive Board appointed and nominated respectively by the District Executive Boards and Associated Bodies:

Eastern District.—Messrs. Thos. Glover, C.B.E., M.Inst.C.E. (Norwich), W. H. Mainwaring (Lincoln), R. G. Shadbolt (Grantham), and W. W. Townsend (Colchester).

Irish District.—Messrs. R. Bruce Anderson, A.M.Inst.C.E. (Waterford, &c.), W. J. Grey, A.C.A. (Dublin), Joseph McNicholl (Cork), and J. D. Smith, M.Inst.C.E., J.P. (Belfast).

London District.—Messrs. F. J. Bradfield, F.C.I.S. (Commercial Gas Company), Thomas Hardie, M.Inst.C.E. (Gas Light and Coke Company), and F. H. Jones, M.Inst.C.E. (Wandsworth, &c., Gas Company).

Manchester District.—Messrs. G. S. Frith (Runcorn), J. H. Sillitoe, A.C.I.S. (Manchester), W. J. Smith, B.Sc. (Bolton), and Samuel Tagg, M.Inst.C.E., J.P. (Preston).

Midland District.—Messrs. Leslie E. Clift (Redditch), Harold Davies (Chesterfield), P. N. Langford (Coventry), and A. W. Smith (Birmingham).

Northern District.—Messrs. Norman S. Cox (Sunderland), Herbert Lees, A.M.Inst.C.E., J.P. (Hexham), T. P. Ridley, F.C.I.S. (Newcastle-on-Tyne), and F. P. Tarratt (Newcastle-on-Tyne).

Scottish District.—Messrs. George Braidwood (Coatbridge), Lawrence Hislop, F.C.S., F.R.S.S.A. (Cowdenbeath), George Keillor (Greenock), J. W. Napier (Alloa), and W. E. Whyte, O.B.E., *Additional Member* (Lanark).

Southern District.—Messrs. C. F. Botley, M.Inst.C.E. (Hastings), Wm. Cash, F.C.A. (Bournemouth), H. C. Head, M.Inst.C.E., M.I.Mech.E. (Winchester), and A. Valon, M.Inst.C.E. (Westgate).

South Wales District.—Messrs. Wm. Clark Jackson, A.M.I.Mech.E. (Neath), W. H. Johns, M.I.Mech.E. (Swansea), and J. E. Kenshole (Merthyr Tydfil).

South-Western District.—Messrs. J. H. Ellis (Plymouth), S. E. Halliwell (Bristol), S. J. Ingram (Truro), and W. N. Westlake (Exeter).

Yorkshire (W.R.) District.—Messrs. Harold E. Bloor, B.Sc., B.Eng. (York), A. E. Mottram (Ossett), E. H. Hudson (Normanton), and C. S. Shapley (Leeds).

British Commercial Gas Association.—Sir Russell Bencraft, M.R.C.S., J.P., Mr. R. Halkett, Alderman F. S. Phillips, J.P., and Sir David Milne-Watson, LL.D., D.L.

Institution of Gas Engineers.—Messrs. John W. McLusky, M.I.Mech.E., H. D. Madden, M.Inst.C.E., M.I.Mech.E., John Terrace, M.Inst.C.E., and John Wilkinson, O.B.E.

Gas Companies' Protection Association.—Messrs. R. J. Auckland, F.C.I.S., R. W. Edwards, D. H. Helps, A.M.Inst.C.E., and W. Phillips.

ANNUAL REPORT.

The annual report, which was next submitted, was in the following terms:

GAS REGULATION ACT.

Section 1—Applications for Orders.—During the period under review (April 1, 1926, to March 31, 1927), eight Orders have been made by the Board of Trade for the substitution of a standard or maximum price per therm in lieu of the existing price per 1000 c.ft.

Section 1—Amending Orders.—During the period under review, four Amending Orders have been made for a revision of the standard or maximum price per therm.

Gas (Amending Orders) Rules, 1926.—In addition to the Amending Orders mentioned in the preceding paragraph, 41 Amending Orders have been made under the Gas (Amending Orders) Rules, 1926, issued by the Board of Trade in July, 1926. These new Rules were designed solely to meet the case of applications based upon the increased cost of coal due to the stoppage in the coal industry in 1926.

Section 10—Special Orders.—During the same period, 39 gas undertakings have lodged applications under this section with a view to extending the powers conferred by their private Acts, and obtaining additional powers.

COAL.

During the difficult period of the stoppage in the coal-mining industry, which lasted from May 1, 1926, until Nov. 26 of that year, the Council made every endeavour to assist gas undertakings to obtain supplies of coal. With a few negligible exceptions, gas undertakings were able to maintain a supply of gas, and the Government were obviously much impressed with the whole-hearted support they received from the industry in the national crisis.

During this period, the Council were in close touch with the Ministry of Mines, and were successful in inducing the Government to refrain from introducing a scheme whereby gas would have been "rationed," and also in obtaining an extension of the period during which the Emergency Regulations should remain in operation, thereby protecting gas undertakings from proceedings for forfeiture for non-compliance with the provisions of the Gas Regulation Act in connection with calorific value and pressure.

The Council also gave much attention and assistance to individual gas undertakings on numerous matters arising out of the coal stoppage and the introduction of Emergency Regulations.

London and North-Eastern Railway Company.—At the termination of the coal stoppage, gas undertakings in the Eastern Counties experienced great difficulty in obtaining supplies of coal owing to the action of the London and North-Eastern Railway; and the Council took the necessary steps to ameliorate the position.

ELECTRICITY (SUPPLY) BILL, 1926.

The Council took an active part in securing amendments to this Bill, with the object of safeguarding the interests of the industry. They succeeded with others in inducing the Government to accept the suggestion that the Electricity Supply Board should be an independent body, and that the Electricity Commissioners should be subservient to them in regard to the formulation of a scheme or schemes for the supply of electricity.

Any gas company or undertaking concerned has the right to appear before the Central Electricity Board and make representations with regard to any such scheme. The Council were also successful in obtaining other amendments. The Bill received the Royal Assent in December, 1926.

GAS LEGISLATION.

For the purpose of facilitating the expansion and development of the gas industry, and of meeting the increased competition from electricity under the Act of 1926, the Council decided to urge the Board of Trade to introduce in Parliament a measure adapting to present-day requirements existing gas legislation, which is not only inadequate, but in many respects unsuited to the needs of the industry.

A very large number of suggestions for the modification of existing gas legislation were collated; and a Memorandum embodying these suggestions has been submitted to the Board of Trade.

RATING.

Having regard to the expressed policy of close co-operation and co-ordination between County Councils and Rating Authorities, a Rating Conference, consisting of a representative from each district, and members of the Rating and Valuation Committee of the Council, was convened; and steps are now being taken to formulate a policy whereby the interests of gas undertakings will be protected in the forthcoming revaluations under the provisions of the Rating and Valuation Act, 1925.

The Conference of Public Utility Associations, for which Mr. Ogilvie (Joint Manager) acts as Joint Hon. Secretary, has had several interviews with representatives of the Ministry of Health with regard to legislation which it was understood the Government were about to introduce in connection with the valuation of "special properties"—*i.e.*, gas, water, electricity, and tramway undertakings in England and Wales.

The Rating (Scotland) Bill passed into law in December, 1926, and the question of valuations in Scotland is being considered by a Committee appointed by the Conjoint Conference of Public Utility Associations composed of representatives of Scottish public utility undertakings.

RAILWAY RATES—STANDARD CHARGES.

Evidence was given on behalf of the gas industry before the Railway Rates Tribunal in July, 1926, opposing the proposed new Schedules of Standard Charges put forward by the Railway Companies. The Council, in co-operation with the Mining Association and the iron and steel industry, asked that the actual rates at which coal was generally passing—viz., an increase of 40 p.ct. upon the base rates, *plus* flat rate, should become standardized and be made the Standard Charges.

The judgment of the Railway Rates Tribunal was published in January, 1927. As it was unsatisfactory in many respects, and would have prejudiced the gas industry as one of the large coal-consuming industries in any future applications to the Tribunal, the Council decided, after taking counsel's opinion, to appeal against the judgment.

The Council has continued to co-operate with the Traders' Co-ordinating Committee of the Federation of British Industries and other bodies in this and kindred matters—*e.g.*, owners' risk rates and exceptional rates.

ELECTRICITY BILLS—"NORTHUMBERLAND" CLAUSE.

In accordance with the decision of the Central Executive Board, the Council have continued their policy of endeavouring to obtain the insertion of the "Northumberland" Clause, or similar clause, in Electricity Special Orders promoted by local authorities, with a view to preventing the electricity undertaking having recourse to the rates. The Council successfully contested a case on behalf of one of its

members; and it is hoped that the Electricity Commissioners will in future adopt a more reasonable attitude with regard to this question.

RAILWAY COMPANIES' BILLS—PROTECTIVE CLAUSES IN FAVOUR OF GAS UNDERTAKINGS.

In accordance with the practice which has been adopted in previous years, the Council have carefully examined the Railway Bills before Parliament, and have drawn the attention of the gas undertakings concerned to such proposals in the Bills as might possibly affect them, and have advised them with regard to the form of protective clause which the circumstances of the particular case might require.

A further step has been taken during the period under review, in that the Conjoint Conference of Public Utility Associations representing gas, water, electricity, tramways, and light railways, has opened-up direct negotiations with the Railway Companies' Association, with the object of reaching agreement upon the general principles governing the question of the respective rights and liabilities of public utility undertakers and railway companies for embodiment in protective clauses to be inserted in future Bills and Orders. These negotiations have now been extended to include canal companies.

ROAD TAR PROPAGANDA.

The British Road Tar Association has lost no opportunity during the year under review of furthering the claims of tar for the treatment of roads; and requests for information are now being regularly received from all parts of the world—a testimony of the success of the propaganda and publicity work of the Association.

The Association has been represented at all the important exhibitions held during the year in connection with the treatment of roads, including the Fifth International Road Congress at Milan in September, 1926, and organized exhibits in connection with the National Coal Products, Chemical, and Engineering Exhibition in Manchester in November, 1926, and the gas exhibition held under the auspices of the Blackburn Corporation Gas Department in March, 1927.

In connection with the exhibition at Manchester, a conference was held at the College of Technology; one day being entirely taken up by a tar symposium organized by a Joint Committee of the Institution of Gas Engineers, the Fuel Section of the Society of Chemical Industry, and the Coke Oven Managers' Association. At this symposium a paper by Mr. W. Gordon Adam was discussed, dealing with tar from the point of view of the highway authority.

A monthly bulletin is now published by the Association for the information of its members, which sets out the work accomplished during the month and the publicity secured for road tar.

A Technical Sub-Committee representing gas undertakings, coke oven owners, and distillers has been appointed by the Association to consider, in the light of information already collected by the Association, the kind of tar best suited for road purposes, and as a result of their investigations to recommend what supplements (if any) to the present Roads Department Specifications are practicable and desirable to further the interests of the producers and users of road tar in England and Wales.

WORLD POWER CONFERENCE.

The first sectional meeting of the World Power Conference was held in Basle from Aug. 31 to Sept. 8, 1926, having been authorized at the first plenary meeting of the World Power Conference held at Wembley in 1924.

The National Gas Council was represented by Mr. Fottrell (Joint Manager), who also deputized for Sir David Milne-Watson on the International Executive Committee.

It was ultimately agreed that another sectional meeting should be held in London in the autumn of 1928, to consider fuel problems; and a Technical Committee of the British National Committee (upon which the Council are represented) is now engaged in preparing a detailed programme based on the general programme outlined by the International Executive Council at Basle.

Mr. Ogilvie has been appointed one of the Joint Hon. General Secretaries, and Mr. Fottrell one of the Joint Hon. Technical Secretaries to the Fuel Conference.

NATIONAL FUEL AND POWER COMMITTEE.

The National Fuel and Power Committee which the Royal Commission on the Coal Industry recommended should be formed has now been appointed to consider and advise upon questions connected with the economic use of fuels and their conversion into various forms of energy, having regard to national and industrial requirements and in the light of technical developments.

Evidence on behalf of the Institution of Gas Engineers and the National Gas Council was given before the National Fuel and Power Committee on March 3, by Mr. Thos. Hardie and Prof. Cobb.

HOME OFFICE COMMITTEE ON THE LAW OF HIGHWAY DIVERSION.

It will be remembered that in October, 1925, Mr. Ogilvie gave evidence before the above Committee on behalf of the Conference of Public Utility Associations, together with Mr. Stilgoe, of the Metropolitan Water Board. The gist of his evidence was that compensation should be given to sub-surface users in cases where they suffered damage owing to the fact that the roads under which their mains and cables were laid had been diverted or stopped up.

After considerable delay, the Departmental Committee published their report in August, 1926. The majority of the members of the Committee expressed the opinion that the question of compensation was outside their terms of reference.

There appeared to be no justification for this suggestion, and the Conference of Public Utility Associations accordingly dispatched a letter to the Home Office, protesting against the view taken by the Committee, and urging that no action should be taken until an opportunity had been given to the Conference to give further expression to their claim for reasonable compensation when their interests had been injured by reason of the stopping-up and diversion of a highway.

STANDARD COOKERS.

Since the sale of "Standard" cookers commenced, the Council has received £1333 from the manufacturers, as against £1195 spent in providing the necessary jigs and patterns and in supplying sample cookers to all the districts.

Up to Dec. 31, 1926, the following "Standard" cookers were manufactured and sold: 631 No. 1 size, 6207 No. 2 size, 6743 No. 3 size, and 413 No. 3 size ("Eye Level").

DIFFERENTIAL CHARGES FOR GAS.

The Committee appointed by the Council to consider the difficulties in connection with the problem of framing a scientific and equitable tariff of gas charges, and the advisability of basing the dividends of sliding-scale companies upon the average price received for gas, published an interim report in July, 1926.

After the most careful examination of the subject, the Committee gave it as their opinion in this interim report that systems of charge other than the flat-rate system would become necessary, and that it was desirable that power should be conferred upon companies operating under the sliding-scale to calculate the authorized statutory dividend upon the average price received for gas, instead of upon the gross or initial price charged. They recommended that they should continue their labours and present a further report. This they were authorized by the Central Executive Board to do; the terms of reference to the Committee being enlarged to embrace consideration of methods of charging for gas other than the present flat-rate system.

The Committee have now completed the first part of their investigations, and are formulating general recommendations which will shortly be submitted to the Central Executive Board. The Committee are now engaged in considering methods of analyzing accounts with a view to arriving at a scientific rate structure.

ELECTRICITY (SUPPLY) BILL, 1927: IRISH FREE STATE.

This Bill was carefully considered by the Council, and various amendments were suggested. One of the officers of the Council was present at an interview in Dublin between representatives of the gas industry in Ireland and the Minister in charge of the Bill. As a result of the steps taken by the Council, it appears highly probable that the amendments suggested will be adopted, and the interests of gas undertakings in Ireland safeguarded; the Minister of Industry and Commerce of the Irish Free State having virtually promised to accept the majority of amendments submitted to him.

JOINT GAS AND ELECTRICITY COMMITTEE.

During the course of the year, a Joint Gas and Electricity Committee was formed, at the request of the Institution of Electrical Engineers, "to consider whether in the national interest an inquiry might advantageously be held into the possibility of closer co-operation between gas and electricity undertakings in promoting capital and fuel economy in the supply of energy derived from coal to the public."

This Joint Committee has appointed three Sub-Committees to consider particular aspects of the questions referred to them; and it is hoped that useful results will accrue from establishing this Joint Committee.

DISTRICT EXECUTIVE BOARDS.

The Council are again much indebted to the District Management Committees, Chairmen, and Secretaries for the assistance rendered by them during the period under review. With the growth of the Council and the increase in their activities, more work has naturally devolved upon them; and the Council would like once more to express their appreciation for the help they have received from this quarter.

Special reference should be made to the excellent work accomplished during the coal stoppage by the District Secretaries in arranging co-operative purchases of coal, and also in assisting individual undertakings which were experiencing difficulty in obtaining supplies of coal.

CO-OPERATION.

Whenever the interests of the industry so demanded, the Council have pursued their policy of co-operation with other Associations and bodies. The Joint Conference of Public Utility Associations, representing gas, water, electricity, tramways, and light railways, has continued its negotiations with regard to the question of mains and cables in highways. Considerable progress has been made. A Joint Committee, consisting of representatives from this Conference and of the Highway Authorities, submitted a clause to an important conference, consisting of representatives of public utility associations and of highway authorities, presided over by Sir Henry Maybury, on July 6, 1926, when it was decided to submit the clause to the constituent associations for their consideration. It is hoped that a satisfactory settlement of this vexed question will be reached.

Government Departments now recognize the Conference as the appropriate body with whom to negotiate upon matters of common interest to the constituent Associations.

The Council also continue to be represented upon numerous Committees of the Federation of British Industries—*e.g.*, Traders' Co-ordinating Committee, Fuel Economy Committee, Taxation Committee, Coal Committee, Rating and Valuation Committee, Transport Committee, Electric Power Committee, &c.

GENERAL.

The work of the Council has continued to increase, both as regards matters of national importance and in connection with questions affecting individual undertakings. Numerous Committees have been appointed during the year to deal with a variety of questions of interest to the industry.

With regard to Bills in Parliament, the progress of any Bill which seemed to threaten the interests of the gas industry has been carefully watched, and amendments moved on behalf of the industry

where these have been deemed necessary in order to safeguard the interests of gas undertakings.

In this connection, it may be mentioned that the Council succeeded in obtaining the inclusion of gas supply in the category of "works" authorized by the Housing (Rural Workers) Act, 1926, in respect of which local authorities might give financial assistance if the schemes to which they related were approved by the Minister of Health.

The Council carefully watched the Public Health (Smoke Abatement) Bill, 1926, through its various stages; and though they did not succeed in obtaining the amendments which they put forward, minor improvements were effected in the Bill, and urban authorities are now empowered to make by-laws requiring the provision in new buildings (other than private dwelling-houses) of such arrangements for heating and cooking as are calculated to prevent or reduce the emission of smoke.

Where problems of sufficient importance to the gas industry have arisen to warrant the taking of counsel's opinion, this step has been taken.

FINANCE.

Income.—The total amount received by way of joint subscriptions to the National Gas Council, the British Commercial Gas Association, and the Institution of Gas Engineers (for Research Work) during the period under review amounted to £58,034, of which sum £15,593 is available for the purposes of the National Gas Council. Of this amount, £1895 represents subscriptions paid in advance, and has, therefore, been carried forward to the financial year 1927-28. An amount of £4041, representing subscriptions paid in advance, has to be brought forward from the last account, 1925-26. The total subscriptions to the National Gas Council in respect of the year ended March 31 last was, therefore, £17,739.

To the above figure of £17,739 there must be added interest on deposit account (£103), sale of sample "Standard" cookers (£178), and payments by manufacturers in respect of sales of the Council's "Standard" gas cookers (£595), making a total of £18,615.

Expenditure.—The expenditure of the Council for the past year amounted to £16,863. The surplus on the year's working is, therefore, £1752, which reduces the accumulated deficit at the date of the last account of £2090.

Reserve Fund.—The sum of £1000 shown in the last account as reserve for the expenses in connection with the acquisition of the Council's offices at 28, Grosvenor Gardens, remains intact.

D. MILNE-WATSON, *President.*
W. J. SMITH, *Secretary.*

SIR DAVID MILNE-WATSON'S ADDRESS.

The PRESIDENT: I now rise to move that the annual report and audited statement of accounts for the twelve months ended March 31, 1927, as circulated, be approved and adopted.

The strenuous times through which the industry has passed during the period in question are reflected, I think, in the full account of the year's work of the Council which is now in your hands. Never has the industry been faced with such overwhelming difficulties in maintaining a supply of gas for the country as it has been called upon to do during the first seven months of the year under review.

A VERY REMARKABLE PERFORMANCE.

The world was ransacked in order to secure the necessary coal. The cost was enormous. It has been estimated that the effect of the coal strike was to increase the coal bill of the gas industry alone by fifteen million pounds. In spite of this, on the average, the price of gas was increased by not more than 25 p.ct.; and to-day we are in the proud position of being able to point to the fact, not only that we did not fail the public in their hour of need, but that after a few brief months we have been able to revert to pre-strike prices. ["Hear, hear."] This, I venture to think, is a very remarkable performance, and one which redounds to the credit of the industry as a whole. I am sure, in spite of the criticism of some consumers whose memory must have been remarkably short, the country not only has every reason to be, but is, in fact, truly grateful for the efforts so successfully put forward by the industry to make good the lack of solid fuel. It is my firm belief that the efforts made by the industry will not go unrewarded, and that we may hope that the experience gained by the public during the period of the coal stoppage will lead to a great extension of the use of gas for both domestic and industrial purposes.

Throughout the stoppage, the Council kept in constant touch with the Mines Department, and, by satisfying the Government that the steps which the industry had taken were sufficient to ensure a continuity of gas supply, prevented the introduction of a system of gas rationing which would have caused great irritation to the public and endless trouble to the gas industry. ["Hear, hear."] It was also necessary for the Council to see that the Emergency Regulations relieved gas undertakings from the penalties and forfeitures which would, under normal conditions, have followed non-compliance with their statutory obligations.

MODERNIZING LEGISLATIVE ENACTMENTS.

At a time when the energies of everyone connected with the industry were concentrated upon one matter, and one matter only—namely, how to obtain coal—it might well have been expected that the Council would not be able to pursue and carry out the many tasks allotted to them. This, however, has not been the case, as a perusal of the report will indicate. In the short time at my disposal this afternoon, I can only deal with one or two of the most important matters, the first of which is, of course, the steps being taken by the Council to modernize the legislative enactments under which the industry is to-day operating. I referred to this matter when addressing you last year; and I feel sure that you will be interested to hear all that has taken place since that time.

In August last, a memorandum embodying the proposals which your Central Executive Board deemed necessary in the interests of the industry was forwarded to the Board of Trade. This memorandum has been published in the "Monthly Reports" of the Council, and is no doubt familiar to you. You will remember that the main objects which the Council had in view were three-fold:

First, to facilitate the raising of additional capital necessary to meet the increasing demand for gas. In this respect, I might say that gas undertakings should, in my judgment, be enabled to-day, as in the past, to issue ordinary stock at any rate at par.

Secondly, to simplify and cheapen the procedure whereby undertakings can obtain further parliamentary powers.

Thirdly, to facilitate amalgamation and joint working, not only among gas undertakings themselves, but also with allied and ancillary industries.

In due course a memorandum was received from the Board of Trade. This memorandum was marked "Confidential;" and we were not therefore able to publish it other than to the members of the Central Executive Board. I am happy to say, however, that the Board of Trade viewed our main proposals with sympathy, but made certain suggestions regarding non-statutory companies to which I shall refer later. Moreover, on two matters of secondary importance the Board of Trade put forward proposals to which your Central Executive Board could not agree. These proposals dealt with the question of forfeitures and penalties and an alteration in the present statutory provisions governing the supply of gas through prepayment meters.

STATUTORY UNDERTAKINGS.

The Board of Trade propose that, as from an appointed day, all statutory undertakings, with the exception of those making less than 20 million c.ft. per annum, should be compelled to sell gas on a thermal basis. This, in effect, is no innovation, as sub-section 5 of Clause 1 of the Gas Regulation Act already gives power to the Board of Trade to compel all statutory gas undertakings to adopt the thermal basis of charge. The only real difference is that those undertakings which have not adopted this policy in the past will be placed upon the same footing, and be compelled to adopt the thermal basis of charge as from one and the same date.

THE SMALLER CONCERNS.

The Board of Trade, however, also suggested that all non-statutory companies, with the exception of those making less than 20 million c.ft. per annum, should be required not only to adopt the thermal basis of charge, but to become statutory—that is to say, be placed under statutory restriction with regard to such matters as their share capital and borrowing powers, dividends, price of gas, and also with reference to the purity of gas and the pressure at which it should be supplied.

The whole subject was reviewed again by the Central Executive Board and considered by the Gas Legislation Committee. A further Committee was also set-up, consisting of representatives of small statutory undertakings and non-statutory companies, for the specific purpose of seeing how far the proposals made would affect the interests of those undertakings. After the fullest consideration, a further memorandum was agreed and submitted to the Board of Trade. The gist of this latter memorandum was that, while the Council were not in a position to oppose measures which would ensure an efficient supply of gas in those few cases where such a supply was not ensured to-day—that is to say, they could not object to the proposal compelling all but the smallest companies and undertakings to supply gas of prescribed purity and calorific value and at a prescribed pressure—yet they objected *in toto* to the suggestion that those small companies and undertakings should be compelled to adopt full statutory status.

Your Central Executive Board is satisfied that the only effect of the adoption of full statutory status would be to make it even more difficult than it is to-day for those small undertakings to raise capital on reasonable terms. No useful purpose would be served by adopting the proposals of the Board of Trade in this respect; and personally I am hopeful that the Board of Trade will not press the matter. So much was your Board impressed with this view that they have urged the Board of Trade to introduce into any new legislation provisions whereby the smaller statutory undertakings in existence to-day—*i.e.*, those with a make of gas not exceeding 100 million c.ft. per annum—should be able to obtain by means of Departmental Order exemption from compliance with any restrictions which might hamper such undertakings in raising additional capital.

CALORIFIC VALUE TESTS.

Again, our experience has satisfied us that, under the present system, when only two or three tests for calorific value are made in any quarter, hardship can easily be inflicted upon the undertaking concerned. Our memorandum, therefore, presses for the amendment of the present statutory provisions so that

in no case shall any determination be made of the average calorific value of the gas supplied during any quarter unless at least six tests of the gas have been made during that quarter. ["Hear, hear."]

Probable Procedure.

In regard to the time the Bill will be introduced, I am hopeful that this will be the beginning of the next parliamentary session. In the interim, the Board of Trade will, I understand, follow a procedure similar to that adopted in the case of the Electricity Supply Bill—*i.e.*, submit our memorandum to a Committee who will consider the proposals in the first instance, and then make recommendations to the Cabinet upon which legislation can be introduced. It has been suggested that the Committee in question should be the National Fuel and Power Committee, which you will recollect was set-up last autumn by the Government in accordance with the recommendation of the Royal Commission on the Coal Mining Industry.

In my opinion, your representatives should have but little difficulty in convincing this Committee that the proposals which are being put forward by the Council are not only in themselves eminently reasonable, but such as are in their broad outline necessary in the public interest. In effect, our proposals amplify the suggestion made in the report of the Coal Commission, which advocated that no obstacle, whether of State regulation or industrial organization, should be placed in the way of the development of industry.

Relief from the Flat-Rate System of Charge.

I do not think I need detain you any longer in regard to this particular subject; but I must again refer to one proposal the importance of which we have stressed in our memorandum, and in regard to which there will, I think, be general agreement—namely, relief from the obligation generally imposed upon undertakings to-day to sell gas upon a flat-rate system of charge. Last year I informed you that a strong Committee had been appointed by the Central Executive Board to investigate thoroughly this particular question. This Committee, under the able Chairmanship of Mr. Botley, have carried out the fullest and most painstaking investigation into the difficult questions underlying the framing of alternative methods of charge, and have presented an interim report which you will all have read. I am glad to say that the Committee have reached certain definite conclusions; but before presenting their final report, they are preparing a statement of costs allocation which will enable every undertaking, large or small, to determine for itself how the Committee's recommendations can be made to apply to its own particular circumstances.

Those who have not come to close grips with this problem do not, perhaps, realize the great difficulties with which it is beset. I would ask you, therefore, to await with patience the findings of the Committee. I am confident that the report, when presented, will make it clear that the time devoted to the problem has been well spent, and that the recommendations of the Committee will be of great value both to the industry and to gas consumers.

Tar for Roads.

Another subject which is of particular importance at the present time is the development of the use of tar for road making and road surfacing. The work which has been carried on by the British Road Tar Association during the past year amply justifies the support which we gave it at its inception. Its work has so far necessarily had to be conducted upon a limited scale; but if, as I anticipate, the amended draft constitution of the Association is approved, we may look forward in the near future to a considerable expansion of its activities.

Railway Rates Appeal.

Of the other matters referred to in the report it is difficult to treat adequately this afternoon. You will have seen that the Council gave evidence on behalf of the gas industry before the Railway Rates Tribunal in July of last year. The judgment of the Tribunal, which was published in January last, was unsatisfactory in many respects, and would have prejudiced the gas industry as one of the largest users of coal. Of those affected by the judgment, the Council alone carried the matter to the Court of Appeal. The Court, while unable to allow the appeal, on the ground that the points were not purely questions of law, upheld the three contentions put forward by the Council, and took the very unusual course of refusing to give costs to the railway companies. I am satisfied that the action taken by the Council has safeguarded the position of the industry in regard to future applications for a revision of Standard Charges for the carriage of Coal and Coke under Section 35, or when such Standard or Exceptional Charges are periodically reviewed by the Tribunal under Section 59 of the Railways Act, 1921.

Rating and Valuation Act.

The modifications introduced by the Rating and Valuation Act, 1925, into the law and practice governing rating and valuation, while not disturbing the principle on which gas undertakings are assessed, have made it necessary for the industry to take steps to ensure that the attempt to secure the uniformity which the Act seeks to introduce does not result in the creation of a precedent in any particular case which might react to the disadvantage of the industry as a whole. Arrangements have, therefore, been made whereby, through the District Secretaries, assisted by committees in their district, headquarters can be kept advised as to the position throughout the country in regard to re-valuation.

Electricity Undertakings.

During the year the Council found it necessary to protect the interests of two of its members in whose areas of supply the local authority was applying for powers to establish an electrical undertaking. We have always made it abundantly clear that we are not opposed to the extension of electricity supply, provided that such extension is not carried out at our expense. Several cases have occurred in the past where the ratepayers were called upon to make good the deficiencies which appeared annually in the accounts of the electricity department. In such cases, the gas undertaking being a large—and sometimes the largest—ratepayer, suffered a double disadvantage not only by being called upon for an additional contribution to the rates, but by having that contribution applied to the bolstering-up of its uneconomic competitor.

Parliament has repeatedly indicated its disapproval of this practice by inserting what has come to be known as the "Northumberland" clause, which provides that, so far as reasonably practicable, the rates charged to electricity consumers shall be sufficient to meet the expenditure incurred in connection with the electricity undertaking. The Electricity Commissioners, when making Special Orders, have shown a disposition to depart from parliamentary practice, and have not required the insertion of this "Northumberland" clause. In two such cases during the year, the Council had to assist the gas undertaking in an appeal to the Minister of Transport and at the local inquiry, respectively. The decision in the latter case has not yet been made known; but it is satisfactory to find that in the former instance the Minister only confirmed the Order with the addition of the clause which we required inserted.

Co-operation with other Bodies.

In pursuance of our policy of co-operation with other bodies representing public services, we have continued to take an active part in the Joint Conference of Public Utility Associations, which, as you are aware, represents gas, water, electricity, tramways, and light railways. Negotiations have continued between the Joint Conference and highway authorities in regard to the question of the alteration or removal of mains and cables in highways in connection with schemes for road reconstruction now being carried out all over the country. Discussions have also taken place with the railway companies regarding the nature of the protection to be afforded in Bills or Orders promoted by the respective parties. We have, as you will see from the report, formed a Committee with the Institution of Electrical Engineers to consider whether any steps might be taken to secure greater economy in the conversion of coal into light, heat, and power.

I have given you merely an outline of the year's work; but a perusal of the annual report will show, not only that there has been no diminution in the activities of the Council, but that the field of their endeavours is continually enlarging. We have every reason to be satisfied with the manner in which we have attacked the problems which have arisen; and with the continuance of your individual support we have every reason to hope that the Council will continue to play its part in furthering the interests of the industry. [Applause.]

Finance.

I had hoped that Mr. Cash would have been here to speak to the accounts. Nobody is better qualified to pass an impartial judgment, but, unfortunately, he is unable to be present. Members will note, in perusing the last annual accounts, that the expenditure of the Council showed a reduction as compared with the previous year of £972. We have therefore been able to reduce our accumulated deficit from £3842 to £2090. Among the items over which the staff have a certain amount of control, you will see that economies have been effected under the headings of stationery and printing, office furniture, &c., members' travelling expenses, and sundry expenses, of approximately £720. The reduction in members' travelling expenses has largely been brought about by co-ordination of meetings. Endeavours have been made to arrange meetings of Committees when representatives are attending other meetings in London. This also reflects a saving in Committee expenses.

It is only right to point out that the item of £538 under Amending Legislation is likely to be increased considerably during the next twelve months, when we hope to see a Government Bill introduced in Parliament to deal with this question.

The expenses of the Committee which is now considering gas charges will also continue. This, as I have already explained, is an important subject. The item of £989 under the heading of "Electricity (Supply) Bill, 1926, and other Electricity Matters" is largely due to the cost of the appeal to the Minister of Transport by the Seaham Harbour Gas and Lighting Company against the Seaham Harbour Electricity Special Order, where the Council were successful, as I have already told you, in procuring the insertion of the "Northumberland" clause.

The item of "Effluents Liquor Research" is a new matter undertaken during the year and remitted for report to the Institution of Gas Engineers. Members will have already read the important first report which has been made thereon. It should be added that during the year a number of cases have been submitted to Counsel for opinion, especially in connection with the legal position of gas undertakings in regard to the coal stoppage and demurrage.

You will see, therefore, that, although there are certain non-recurring items and items in regard to which expenditure will be reduced, on the other hand increased expenditure must certainly be incurred under other headings; and on the balance it is improbable that we shall be able to conduct our work at a lower expenditure than that incurred in 1925-26. It is a matter of great difficulty to make an accurate forecast; and we have felt it wise to ask our members voluntarily to increase their contribution from 5s. to 6s. per million c.ft. of gas made. I am happy to say that our appeal has met with a most gratifying response. The allocation of the additional subscription must, of course, be deferred until the needs of the three bodies during the current year have been more carefully gauged. The Council's expenditure is subject to continual scrutiny; and I have no hesitation in asking you to approve the accounts.

RESOLUTIONS.

Alderman Sir WILLIAM KAY (Manchester), seconding the adoption of the report and accounts, said he wished to draw attention to the ever-widening sphere of influence of the Council. While economy might be practised at one end, they were bound, in watching-over the interests of so large an industry, to incur additional expenditure in an ever-growing circle of activity. Every care had been taken in the past, and would continue to be taken in the future, to see that the money was wisely and properly expended.

Without further remarks, the motion for the adoption of the report and accounts was unanimously agreed to.

THE PRESIDENT.

Mr. FRANK H. JONES said he desired in the first place to ask those present to accord the President the heartiest possible vote of thanks for the work he had done in the past year. It was unnecessary for him to tell them how invaluable this work had been. They owed him a deep debt of gratitude.

The vote of thanks having been carried by acclamation,

Mr. JONES proceeded to propose the re-election of Sir David Milne-Watson as President for the ensuing year. He did this, he said, with somewhat mixed feelings, because he had always been taught not to take advantage of anybody. In spite, however, of his doubts as to whether they ought to continue to impose upon Sir David this great work, which he carried out so ably, it was a pleasure to put this proposition forward, because he knew the duties would be as well fulfilled as in the past, and because he knew equally well there was no one else who could perform the duties in the same way. This, he thought, was a pity; but that had nothing to do with the meeting. Sir David possessed the confidence of the National Gas Council; and the National Gas Council had the confidence of the gas industry. The Council were doing a very great work. Indeed, what some of the small undertakings would do if there were no National Gas Council to refer to, he really did not know.

Mr. W. E. WHYTE (Lanark), in seconding the resolution, said he should have liked, had it been possible, to do so in the name of Scotland, rather than as an individual, for they in Scotland looked upon Sir David as the doyen of the gas industry. His wide experience and great knowledge, and the care and attention which he devoted to the work of the Council, hardly needed to be mentioned, let alone to be emphasized; but, in addition, he possessed very special qualities as a President or Chairman. His fairness, his consideration, and his urbanity had meant much to the Council in the past. In fact, there could be no doubt that the harmonious working of the Council and of the gas industry had been in no small measure due to their President's personality and his ability.

The resolution having been carried with applause,

The PRESIDENT thanked the mover and seconder for their kind remarks, and the members for the cordial way in which they had received the proposition. Of course, he would be very glad if someone else would come forward and take up the position; but as they seemed to wish him to continue in the office of President a little longer, he could only express his gratitude for this renewal of their confidence, and assure them that, with the support of the members, he would do his best during the coming year to further the aims of the Council.

OTHER OFFICERS.

Councillor W. J. HARVEY proposed the re-election of Alderman Sir William Kay as Hon. Treasurer, Mr. H. Wade Deacon, C.B.E., and Alderman J. H. Lloyd, M.A., as Trustees, and Mr. F. W. Goodenough, C.B.E., and Mr. W. E. Price, A.M.Inst.C.E., as Hon. Secretaries. He said he felt his task to be an honour, without being unduly onerous. This was very largely due to the fact that the gentlemen whose names he had to propose had so admirably performed their duties in former years that their re-election seemed to follow as a matter of course. The interests of the Council were safe in their hands; and in re-electing them to their respective positions, they must not omit to thank them for the work they had done in the past.

Mr. J. W. WHIMSTER (Bath) seconded the motion, which was agreed to.

On the proposition of Mr. A. W. BROOKES (British Gas Light Company), seconded by Mr. F. J. BRADFIELD (Commercial Gas Company), Mr. Alfred Morland, F.C.A., was re-appointed Auditor.

VOTES OF THANKS.

The PRESIDENT, proposing a vote of thanks to the Chairmen and Secretaries of the District Executive Boards for their services during the past year, said these gentlemen and the Committees were the very essence of the Council's working. The organization was no London affair. It was one that had spread throughout the length and breadth of the land; and its general success was measured by the success of its activities in the Provinces.

Alderman GEORGE CLARK (Chesterfield) seconded the vote, which was passed unanimously.

Mr. NORMAN S. COX (Sunderland), returning thanks on behalf of the District Chairmen, said the lion's share of the work fell upon the Secretaries.

Mr. J. W. NAPIER (Alloa), in acknowledging the vote for the District Secretaries, said there was one suggestion he would like to make. A great deal of the work of the districts was apt to be locked away in the minute books, and not brought to the attention of the administrators of the industry—the Directors of Companies and Chairmen and members of Gas Committees. It was quite true that they had the monthly reports and the annual reports, with their limited circulations; but he did feel that there was a want, inasmuch as Directors and Committeemen were not made aware of a good deal of the work that was carried out by the districts. The suggestion had already been made that the annual report should be circulated to members of Committees and Directors; and this was so much to the good. He did feel—speaking particularly for Scotland, though he thought it must be the case also in other districts—that there was very valuable work being done knowledge of which did not reach the administrators of gas undertakings; and he therefore ventured to urge that something should be done in the direction he had indicated. He also wished to acknowledge the services of Mr. W. J. Smith, who was so helpful to them all. Without the enthusiasm and devotion of the Secretary, they would be labouring under great disabilities.

The PRESIDENT said he next desired to propose a vote of thanks to the Finance and other Committees of the Council. Without these Special Committees, a great deal of additional work would be put upon one or two individuals who could ill-afford time to undertake it. The Committees were, in fact, invaluable to them; and in this connection he would like particularly to mention Mr. Botley's name. He had rendered yeoman service during the past year. Others also had done much good work.

Mr. C. VALON BENNETT (Rochester) seconded the vote, which was unanimously accorded.

Mr. R. BRUCE ANDERSON (London), returning thanks on behalf of the Finance Committee, said the Central Executive Board spent the money; but the Committee had to take care that they did not spend too much. However, notwithstanding the check which the Committee endeavoured to impose upon the expenditure, it had become necessary to ask the members to subscribe more. When they considered the work there was to be done, there were, he was sure, very few who would feel inclined to grumble at having to pay this extra amount. ["Hear, hear."] In some directions the benefits derived from the expenditure were indirect; but in others they were direct—as, for example, in connection with Workmen's Compensation Insurance. In some cases these direct savings had amounted to much more than the subscription, and in nearly every case they easily covered the contribution.

Mr. C. F. BOTLEY (Hastings), acknowledging the vote on behalf of the other Committees, said he had not had an opportunity of consulting any of the members of these Committees as to what he should say for them in reply to the thanks accorded. Therefore perhaps he might be permitted to refer, from his own knowledge, to the extraordinary care and devotion with which they approached any task which was put before them on behalf of the industry. He thought it was wonderful that they should have in the industry volunteers who would thus devote themselves heart and soul to any subject that might be entrusted to them, with the sole object of benefiting the industry.

The PRESIDENT said he was sure they would not like to separate without passing a cordial vote of thanks to the staff—Mr. Fottrell, Mr. Ogilvie, Mr. Smith, and the other members. The Council enjoyed the most devoted service from all; and it was difficult to differentiate between them. Their ability and their resourcefulness was beyond praise. They worked hard night and day; and he proposed that the hearty thanks of the meeting be given them for their labours. [Applause.]

Mr. FOTTRELL, returning thanks on behalf of himself and his colleagues, said they all recognized how much they owed to the members generally for the support which never failed them, and without which their work would be nothing like so pleasant as it was.

LIQUOR EFFLUENTS RESEARCH COMMITTEE.

INSTITUTION OF GAS ENGINEERS.

FIRST REPORT.

In the "JOURNAL" for July 13 were published Part I. of Dr. A. Parker's Memorandum on the "Disposal of Liquor Effluents from Gas-Works," his summary and conclusions, and the "Summary of Conclusions from Experiments at Hinckley" by Dr A. C. Monkhouse. The remainder of the First Report of the Liquor Effluents Research Committee of the Institution of Gas Engineers is published to-day.

DR. A. PARKER'S MEMORANDUM.—PART II.

INFLUENCE OF EFFLUENT GAS LIQUORS ON STREAMS AND SEWAGE PURIFICATION.

Effluent spent gas liquor from the distillation of ammoniacal liquor is usually brown in colour and turbid with particles of spent lime and tarry matters. Most of the lime settles readily, leaving a liquid possessing a high affinity for oxygen. A discharge of this type has a detrimental effect on small streams; the water being rendered poisonous to fish and cattle, and unfit for ordinary uses. Further, the capacity of spent gas liquor for absorbing oxygen retards or prevents the self-purification which takes place in all streams under ordinary conditions.

The de-oxygenating power of spent liquor, as usually determined by N/80 potassium permanganate solution, does not necessarily give a comparative figure as regards toxicity to fish life. For example, phenols and thiocyanate readily reduce permanganate, but the toxicity of phenols is proportionately much greater than that of thiocyanate. The permanganate test, however, is simple, and de-oxygenating power does give an indication of the extent to which the spent liquor retards self-purification if admitted to streams, or increases the difficulties of sewage disposal if admitted to sewers.

Frankland and Silvester calculated the theoretical quantities of oxygen which could be absorbed by phenol, thiosulphate, and thiocyanate on the assumptions:

1. **Phenol** . . . . $C_6H_5OH + 7O_2 \rightarrow 6CO_2 + 3H_2O$
2. **Thiosulphate** . . $S_2O_3 + 2O_2 \rightarrow 2SO_3$
3. **Thiocyanate** . . $CNS + 3O \rightarrow SO_3 + CN$

These investigators also determined experimentally the oxygen absorbed by these substances as measured by N/80 potassium permanganate at 27° C. (80° Fahr.) for four hours, and obtained the following results:

Oxygen Absorbed, Parts by Weight.

Unit Weight.	Experiment.	Theoretical.
Phenol, C_6H_5OH	1·78	2·38
Sulphur (in thiosulphate)	0·856	1·00
CNS (in thiocyanate)	0·827	0·827

These experimental figures may be employed in conjunction with results of chemical analysis to ascertain the proportions of the total oxygen absorbed by spent liquor which may be assigned to the individual constituents.

The deleterious effects of spent gas liquor on sewage purification processes may be evaluated approximately by comparisons of the oxygen absorption figures of typical sewages and of typical spent liquors. The oxygen absorption values of representative domestic sewages, as measured by N/80 permanganate of potash at 80° Fahr. for four hours may be represented as:

	Oxygen Absorbed. Parts per 100,000.
Strong domestic sewage	15
Average ,, ,, ...	10
Weak ,, ,, ...	5

Assuming that the corresponding oxygen figures of spent liquors resulting from the distillation of ammoniacal liquors from horizontal and continuous vertical retort systems are respectively 400 and 750 parts per 100,000, the following tables have been constructed to show the oxygen absorption values of mixtures of domestic sewage and spent gas liquors in the proportions of one and two volumes of spent liquor to 100 volumes of sewage:

Mixtures of Sewage and Effluent Liquors from Horizontal Retorts.

	Oxygen Absorbed. Parts per 100,000.		
Vols. Spent Liquor per 100 Vols. Sewage .	0.	1.	2.
Strong domestic sewage	15	18·9	22·7
Average ,, ,, ...	10	13·9	17·8
Weak ,, ,, ...	5	8·9	12·9

Mixtures of Sewage and Effluent Liquors from Continuous Vertical Retorts.

	Oxygen Absorbed. Parts per 100,000.		
Vols. Spent Liquor per 100 Vols. Sewage .	0.	1.	2.
Strong domestic sewage	15	22·4	29·7
Average ,, ,, ...	10	17·4	24·8
Weak ,, ,, ...	5	12·4	19·9

Presumably the work of actual purification of town sewage will be approximately proportional to the quantity of oxygen required. With the particular conditions assumed in the construction of the two preceding tables, the figures show that the work of purification is increased by the admixture of spent gas liquor. For example, one volume of spent liquor, with O/A value 400, added to 100 volumes of strong domestic sewage increases the total oxygen absorbable from 15 × 100 to 18·9 × 101, or 1·27 times; and two volumes of liquor, with O/A value 750, added to 100 volumes of weak domestic sewage, increases the oxygen absorbable from 5 × 100 to 19·8 × 101, or 4 times. In actual practice, purification as measured by permanganate is not carried to completion, so that the influence of the addition of spent liquor is greater, relatively, than indicated by the figures given; and further difficulties arise in that perfect admixture of spent liquor and sewage is not always easy in practice.

The effect of admission of spent gas liquor to the sewers might be further illustrated by a concrete example. An average sample of the sewage of a particular town (industrial and residential) absorbs 11 parts of oxygen per 100,000, when all gas liquor is excluded. When spent liquor is admitted to the sewers the O/A figure becomes 23 parts per 100,000. The sulphate plant is ordinarily operated day and night during alternate fortnights, so that if a balancing tank were installed, and the spent liquor run into the sewers at a uniform rate, the average sewage would absorb 17 parts of oxygen per 100,000. The O/A figure of the spent gas liquor in this instance is approximately 900, so that the total volume of gas liquor relative to the volume of sewage from other sources is given by

$$\frac{17 - 11}{900 - 17} = \frac{0{\cdot}68}{100}$$

or about 0·7 p.ct. of the sewage. Assuming that the sewage purification be conducted to reduce the oxygen absorbed figure to 1, the relative amounts of purification required with and without gas liquor would be

$$\frac{100{\cdot}68 \times 16}{100 \times 10} = 1{\cdot}6$$

PART III.

METHODS PROPOSED FOR REDUCING OR ELIMINATING THE DIFFICULTIES OF DISPOSAL OF LIQUOR EFFLUENTS.

In this part the methods which have been proposed are classified under the following heads:

A. Modifications of usual practice with a view to decreasing the amount of spent gas liquor.
B. Modifications of usual practice with a view to improving the composition of spent gas liquors.
C. Methods proposed for the purification or disposal of spent gas liquor.

MODIFICATIONS IN MANUFACTURE WITH THE OBJECT OF DECREASING THE AMOUNT OF SPENT GAS LIQUOR.

The volume of effluent spent liquor is usually about 1·5 times the volume of ammoniacal liquor, so that any reduction in amount of the latter should result in a corresponding reduction in the amount of effluent.

The liquor collected during the carbonization of coal results from the moisture accompanying the coal charged into the retorts, the water formed during carbonization of the coal substance, and water supplied to the scrubbers for the purpose of washing the gas. With steamed vertical retorts the quantity of liquor is also augmented by the steam which passes through the retorts without undergoing decomposition.

Examples of water balances from carbonization in continuous vertical retorts without and with steam have been taken from the Fourth Report of the Gas Investigation Committee of the Institution of Gas Engineers.

Carbonization in Continuous Vertical Retorts (Uddingston). Water Balances. Gallons per Ton of Coal as Charged

Test No.	1.	3.
Steam to retorts, p.ct. weight of coal	*Nil*	11·3*
Moisture in coal	22·0	22·0
Water from coal substance	11·6	11 6
Water supplied to scrubbers	19·5	16·5
Steam not decomposed	*Nil*	9·0
Liquor made, total	53·1	59·1
Strength of liquor, ozs. per gallon	7·3	7·0

* Equivalent to 25·3 gallons.

The coal used in these experiments contained approximately 10 p.ct. of moisture, resulting directly in 22 gallons of liquor per ton of coal. This amount could obviously be reduced by the use of drier coal. The water formed by distillation of the coal substance, 11·6 gallons, could not be reduced with the particular coal without radical changes in the carbonization process. The water supplied to the scrubbers might be eliminated by the installation of acid washers in place of water scrubbers. The water from undecomposed steam cannot be eliminated when steaming is practised, but it can be kept to the minimum by ensuring optimum steaming conditions.

The various methods which have been proposed for ensuring that the quantities of ammoniacal liquor and spent liquor are kept to the minimum will now be considered.

1. *Moisture in Coal.*—Different types and qualities of coal contain different amounts of moisture. Washed nuts frequently contain 10 to 12 p.ct. of moisture, equivalent to 22 to 27 gallons per ton. Air-dried coal retains, at ordinary temperature, from 1 to 7 p.ct. moisture, or 2 to 16 gallons per ton. Preliminary drying of coal prior to carbonization has not been proposed as a means of reducing difficulties with liquor effluents, but the moisture content of the coal charged into the retorts undoubtedly has an important influence on the volume of ammonia liquor collected. For example, in the tests at Uddingston the moisture in the coal (10 p.ct. by weight) accounted for 22 gallons of liquor per ton, or 41 and 37 p.ct. of the total volumes of liquor in the tests quoted. If the moisture in the coal, in these instances, had been reduced to 5 p.ct., the volume of liquor might have been decreased by 11 gallons per ton of coal. The strengths of the liquor would have risen in proportion as regards ammonia, but the oxygen absorption values would probably not have increased in the same degree, so that a small improvement as regards total effluent liquor might have resulted.

2. *Acid Washer.*—The installation of an acid washer supplied with dilute sulphuric acid in place of the usual water scrubber reduces the volume of liquor by the amount of water ordinarily supplied to the scrubbers, since the acid liquor from the washer may be used in the saturator of the sulphate plant. In the tests at Uddingston this would have reduced the volumes of ammonia liquor by 19·5 and 16·5 gallons per ton of coal, or by 37 and 28 p.ct. of the total volumes of liquor. In the absence of complete data it is difficult to ascertain the reduction in the total oxygen absorption figure (total volume of liquor × O/A per 100,000) of the effluent which would result from the use of an acid washer. In some instances of steamed vertical retorts no saving could be effected by the installation of an acid washer, since no water is ordinarily supplied to the scrubbers.

3. *Counter-Current Scrubbing.*—One method of reducing the total volume of liquor is to use the counter-current principle in washing the gases, by employing liquor from the scrubbers in an earlier stage—for example, in the hydraulic main. A smaller amount of water is then required in the scrubbers.

The spent gas liquor might also be utilized in making up milk of lime.

The volume reductions resulting from either or both methods, however, must be small.

4. *Fixed Liquor in Scrubbers.*—Grossmann and Wyld (J.S.C.I., 1906, **25**, 411) remove only free ammonia from the liquor in the still, and employ the still liquor in the scrubbers until the concentration of fixed ammonium salts, &c., is sufficient to repay recovery.

5. *Direct Ammonia Recovery.*—This method of ammonia recovery is frequently adopted in coke-oven practice. The writer is not aware of any similar direct recovery process in actual operation in gas-works with usual types of carbonization systems, though installations have been erected. These installations, however, have proved unsatisfactory. As adopted in coke-oven practice, the following arrangement of plant is typical:

Coke ovens, foul main, cyclone tar extractor, centrifugal or fan type tar extractor, exhauster, saturator, naphthalene extractors, water-cooled condensers, &c.

The plant is so arranged that the temperature of the gas is kept above 70° C. until it leaves the saturator and enters the water coolers. Fixed ammonia liquor and tar condense out in the sections prior to the saturator. After separation from the tar, the fixed ammonia liquor is usually circulated through the tar extractors until it attains the desired strength, when it is sold as concentrated fixed ammonia liquor or is evaporated in open vessels for the production of crude ammonium chloride containing less than 2 p.ct. of ammonium sulphate.

A small quantity of tar collects on the surface of the liquid in the saturator, but this is readily removed. Since the gas leaves the saturator at above 70° C. and is saturated with water vapour, from 20 to 30 gallons of aqueous liquor, together with some light oil, separate out in the water-cooled condensers. This aqueous liquor, which contains phenols and small quantities of ammonia, is frequently added to the water used for coke quenching; but in one installation visited it was cooled and circulated over the horizontal condensers in which it had previously separated.

The following points in connection with direct ammonia recovery are of importance when considering the possible application of the method to gas-works practice.

(*a*) A saturator cannot be operated successfully with gas flows much greater or less than the rate for which it was designed.

(*b*) Arrangements must be made to prevent the accumulation of naphthalene in the condensers, &c., following the saturator.

(*c*) The pressure drop in the saturator is comparatively large.

(*d*) The temperature of the gas entering the saturator should not be below dew-point.

(*e*) The quantities of sulphuretted hydrogen, hydrocyanic acid, and carbon dioxide in the cooled gas are greater than when ammonia liquor is allowed to condense as in ordinary gas-works practice, since ammonia liquor dissolves a proportion of these gases. Greater purifying area would, therefore, be required if direct ammonia recovery systems were adopted.

(*f*) The only effluent to be dealt with is the liquor which collects in the condensers following the saturator, with the exception of an almost negligible quantity of mother liquor produced if the fixed ammonia liquor is evaporated for the separation of crude ammonium chloride. Very little information is available in regard to the composition of the liquor which collects in the condensers following the saturator, but arrangements have been made to obtain representative samples from coke-oven installations. A sample which has already been obtained gave the following results on analysis:

Liquor from Condensers of Coke Oven with Direct Ammonia Recovery.

	Grammes per 100 C.C.
Ammonia, total	0·051
Cyanide as HCN	0·006
Sulphide as H_2S	0·004
Thiosulphate as S	0 020
Thiocyanate as CNS	0·024
Phenols as C_6H_5OH	0·630
	Parts per 100,000.
Oxygen absorbed—	
Calculated	1158
Determined (N/80 $KMnO_4$, 4 hours, 27° C.)	1246
Difference between calculated and determined	88

The figures show that the percentage of phenols in the condensate was high, but that the amounts of other constituents were small. The phenols present would account for an oxygen absorbed value of 1121 parts per 100,000, which represents 97 p.ct. of the total calculated value, or 90 p.ct. of the determined value.

The demand for gas which has to be met by the average gas undertaking varies considerably according to the time of the year. It has already been mentioned under (*a*) that a saturator cannot be operated successfully with large fluctuations in rates of gas production. With low rates, salt deposits on the curtain plates of the saturator and causes stoppages. This has been the main reason for the failure of the direct ammonia recovery installations erected in connection with gas retorts.

Modifications in Manufacture with the Object of Improving the Composition of Spent Gas Liquor.

The total amounts of the objectionable constituents—phenols, thiocyanate, and thiosulphate—in spent liquor are approximately equal to the amounts contained in the ammonia liquor when the latter is distilled for the manufacture of sulphate by usual processes. If, then, the total quantities of these three constituents in the ammonia liquor can be reduced, a corresponding improvement in the effluent spent liquor should be effected. The methods of reducing the volume of spent liquor, already mentioned, might be included under this heading, provided the concentrations of phenols, &c., are not increased by amounts sufficient to counterbalance the diminution in volume. It is intended, however, to discuss modifications of usual practice which have been proposed with the object of reducing the total amounts of the objectionable constituents by reducing their concentrations in ammonia liquor. The several factors which cause the presence of phenols, thiocyanate, and thiosulphate in ammonia liquor will first be considered.

Phenol (C_6H_5OH) and Higher Tar Acids.—These substances ought to be classed as tar, but they are, to some extent, soluble in liquor; and the volume of liquor is greater than the volume of tar. It is usual to find a larger total quantity of

the phenol (C_6H_5OH) in the liquor than in the tar, especially with continuous vertical retorts. Laboratory experiments also lead to the conclusion that the phenols are more readily extracted from tar by solutions of free ammonia than by solutions of fixed ammonia (61st Alkali Report, 1924).

Thiocyanate.—A proportion of the thiocyanate present in ammonia liquor is due to the interaction of carbon bisulphide with ammonium polysulphide; but it appears probable that, in the main, thiocyanate is an oxidation product due to interaction of oxygen, sulphide, and cyanide in the cooler parts of the condensing system (61st Alkali Report, 1924).

Thiosulphate.—Generally, the conditions which favour the formation of thiocyanate also favour the formation of thiosulphate. This has been shown by analyses by E. Linder of the same liquor before and after storage for six months. From these analyses it was found that in the liquor after storage larger proportions of the total sulphur were present as thiocyanate and thiosulphate.

The following modifications of usual practice have been proposed for reducing the concentrations of phenols, &c., in ammonia liquor as collected.

1. *Early Separation of Tar and Liquor.*—In coke-oven installations in which ammonia is recovered by direct processes the major portion of the tar must be removed before the gas enters the saturator. The tar is removed from the hot gas (70° to 80° C.) by a spray tar extracting apparatus in which the gas is met by a large volume of tar or liquor or both, or by a cyclone tar separator, followed by a dynamic tar extractor consisting of a casing in which a suitable rotor is made to revolve at about 600 R.P.M. Some liquor separates out with the tar; but since the temperature of the gas is maintained above 70° C., the major portion of the water remains as vapour and travels forward with the gas. In this manner heavy tar is removed as early as possible and the minimum contact of tar and liquor is ensured. Further, the small quantity of liquor which condenses with the hot tar is rich in fixed ammonia, but contains relatively small amounts of free ammonia, and higher tar acids are not dissolved so readily by solutions of fixed ammonia as by solutions of free ammonia. The lightest fractions of tar are carried forward with the hot gas and, together with water, condense in the coolers following the saturator.

It would appear from the work described in recent Alkali Reports that the application in gas-works practice of methods of extraction of tar from hot gas might result in reductions in the concentrations of higher tar acids in ammonia liquor. Further systematic investigation, however, is necessary before definite and quantitative conclusions can be drawn.

2. *Minimum Circulation of Liquor.*—It has already been pointed out that thiocyanate and thiosulphate appear to be oxidation products. The oxidation might, to some extent, be prevented by rapid cooling of the gas (already freed from tar at 70° to 80° C.) and rapid removal of liquor from the system. The circulation of liquor in gas mains and scrubbers should, therefore, be reduced to the minimum, since gas always contains some oxygen. The oxygen in the gas should be kept as low as possible, and air required for purification should be admitted at the inlet to the purifiers after the removal of all liquor condensates. Storage arrangements for liquor should be such as to allow minimum contact with air, and for the same reason the liquor should be distilled as early as possible, and long periods of storage avoided.

3. *Removal of Cyanide.*—The amount of thiocyanate in the liquor could be reduced considerably by the removal of hydrocyanic acid from the gas before condensation of liquor has occurred. This necessitates a cyanogen recovery process operating on the hot gas, but it would appear that a satisfactory process of this type has not yet been devised.

Methods of Purification or Disposal of Spent Gas Liquor.

The capacity of spent gas liquor for absorbing oxygen is the chief factor in retarding the purification of streams or of sewage with which it may be mixed. Spent liquor might, therefore, be purified either by the removal of the objectionable oxygen-absorbing constituents by physical or chemical methods, or by the conversion of these constituents by chemical (including oxidation), biological, or other means into substances which do not absorb oxygen. The following methods for the purification of spent gas liquor and ammonia liquor have been proposed.

1. *Biological or Bacterial Oxidation of Mixtures of Sewage and Spent Gas Liquor.*—Pasteur classified bacteria as (*a*) aerobic bacteria, requiring oxygen, (*b*) anaerobic bacteria, living practically without oxygen, and (*c*) facultative anaerobic bacteria, or those living either with or without oxygen. Ordinary sewage contains in itself the active agents required for its purification in the bacteria which break down to simpler substances the complex organic matter present in the sewage. Chemical and physical actions also operate; but sewage purification, whether by land filtration, contact beds, sprinkling filters, or by the activated sludge processes, is mainly the outcome of the activities of bacteria, especially of the aerobic class.

It has been definitely proved by long experience in many towns that sewage containing spent gas liquor in usual proportions is amenable to treatment by ordinary methods of filtration; but, though the volume of spent liquor is generally only of the order of 1 p.ct. of the volume of sewage, the high oxygen absorption value of spent liquor necessitates an appreciable increase in purifying area.

P. F. Frankland and H. Silvester (J.S.C.I., 1907, **26**, p. 231), as the result of an investigation of methods of purification of sewage at Oldbury, concluded that the presence of a large proportion of gas liquor waste in sewage occasions considerable but not insuperable difficulties in purification by bacterial means. By providing a large area of beds, giving triple contact, and permitting only a diminished flow of sewage on the beds, satisfactory purification can be effected of any proportion of gas liquor waste occurring in Oldbury sewage—*i.e.*, up to 9 p.ct. of the flow.

H. Maclean Wilson and W. J. Read also conducted laboratory experiments on mixtures of sewage and spent gas liquor. The filter was fed with crude domestic sewage for a few weeks, then for a week or so with a sewage containing about 8 p.ct. of gas liquor, at the end of this period reverting to domestic sewage. The rate of filtration was slow—15 gallons per cub. yard of filtering material per day of 8 hours. The results, in general, showed that so long as the rate of flow did not exceed this amount, sudden changes in composition did not materially disturb the operation of the filter. In these experiments the filter used had previously purified gas liquor, and was, therefore, provided with the necessary flora and fauna.

Wilson and Read also carried out experiments to determine the effects of spent gas liquor on the activated sludge process. Though purification could be effected, the results were not so satisfactory under the particular conditions of experiment as with the percolating filter. Further experiments on this subject are desirable.

2. *Bacterial Purification of Spent Liquor without Admixture with Sewage.*—G. J. Fowler and his collaborators carried out an extensive series of experiments, the results of which were published in 1911, to determine the degree of purification of spent gas liquors which can be effected by bacterial filtration. In these experiments the filters were first matured by treatment with sewage, and the filters were afterwards employed in the purification of spent liquor diluted with water. As soon as the effluent from the filters showed a purification of 80 p.ct. of the diluted liquor, the purified effluent was used in place of water as the diluent. In experiments carried out at the Bradford Road Works of the Manchester Corporation Gas Department, one volume of spent gas liquor was diluted with nine volumes of treated effluent, and the rate of flow was 100 gallons of diluted liquor, equivalent to 10 gallons of original spent gas liquor, per day per cub. yard. The purification obtained was 92 to 98 p.ct., calculated on the undiluted liquor. The oxygen-absorption value of the spent gas liquor was approximately 500 parts per 100,000, so that the process reduced this figure to between 10 and 40 parts per 100,000. This amount of purification would not be sufficient to allow the treated effluent to be run into streams of small volume, but would be ample to allow of discharge into sewers.

The Fowler system was put into operation at the Bradford Corporation Chemical Works about 1908, and has been in operation ever since. The filters are constructed of graded clinker. The bottom layer, to a depth of 1 ft., is of 4 in. to 6 in. size; above this there is a 1 ft. layer of 1 in. to 2 in. clinker, and finally 6 ft. depth of from ½ in. to 1 in. size. The degree of purification obtained during the first few years was similar to that obtained in the experiments carried out at Manchester, but owing to the higher oxygen absorption value of the spent gas liquor (over 700 parts per 100,000) the dilution was 1 in 20 and the rate of flow 80 gallons of diluted liquor, equivalent to 4 gallons of spent gas liquor, per cub. yard per day.

It is interesting to note that during their investigations Fowler, Ardern, and Lockett succeeded in isolating a special organism which oxidizes phenol.

As a result of experiments carried out by H. Maclean Wilson and W. J. Read, these investigators concluded that a spent gas liquor, diluted until the oxygen absorbed in 4 hours is 400 parts per 100,000, is amenable to biological filtration. One filtration at the rate of 15 gallons per cub. yard per 8-hour day reduces the oxygen absorbed by 90 to 95 p.ct. A further filtration of this effluent on a similar filter at the rate of 12 gallons per cub. yard per day of 8 hours gives an effluent absorbing less than two parts of dissolved oxygen per 100,000.

Experiments on biological filtration of spent gas liquor are also described in the 60th Alkali Report, 1923.

3. *Oxidation of Spent Gas Liquor by Chemical Means.*—It would appear possible to purify spent liquor by oxidation by various oxidizing agents, such as air, oxygen, ozone, hypochlorites, &c. Experiments so far conducted, however, have not shown promise of success as large-scale propositions. Some oxidation does occur when air is blown through spent liquor, and the power for absorbing oxygen is reduced; but even when the air is supplied in a finely-divided condition by means of porous tiles, oxidation is extremely slow. It is interesting in this connection to calculate the amounts of oxygen or air required for spent gas liquors. A liquor which absorbs 1000 parts of oxygen per 100,000 theoretically requires per 1000 gallons of liquor 100 lbs. of oxygen—*i.e.*, approximately 1200

c.ft. of oxygen or 6000 c.ft. of air measured under ordinary conditions of temperature and pressure.

W. McD. Mackey has succeeded in oxidizing spent liquor by means of ozone, but the method is too expensive for industrial purposes.

Frankland and Silvester examined the action of bleaching powder (calcium hypochlorite) in presence of sulphuric acid on spent gas liquor, but found that even with 0·3 lb. of bleaching powder per gallon of liquor the purification effected was less than 50 p.ct., the oxygen absorption figure being reduced only from 300 to 165 parts per 100,000.

4. *Removal of Phenol (C_6H_5OH) from Spent Gas Liquor by Simple Boiling.*—Phenol (C_6H_5OH) is volatile in steam, and attempts have been made to remove it from spent liquor by boiling in an open tank; but, even after acidification, the amount of phenol volatilized was too small to make such a method practicable.

5. *Removal of Phenol (C_6H_5OH) and Colour from Spent Gas Liquor by Flue Gases and Steam.*—Spent gas liquor is generally slightly alkaline, and the colour can be destroyed by rendering the liquor acid. Acidification can conveniently be effected by sulphur dioxide from a Claus kiln or by flue gases. When decolorized by these methods, however, at temperatures much below boiling-point, sulphur dioxide enters into solution, and the oxygen absorption value of the spent liquor is thereby increased, and the colour returns when the liquor is made alkaline.

By the passage of steam and hot flue gases through spent liquor, provided the temperature of the liquor be maintained above 90° C., the colour can in many instances be removed, and at the same time a considerable proportion of the phenol (C_6H_5OH) can be volatilized, resulting in a reduction in the oxygen-absorption capacity of the liquor. The most satisfactory published results by this method were obtained at the Hornsey Gas-Works, where decolourizing and dephenolating towers have dealt with the whole of the effluent liquors produced in the manufacture of 2½ to 3 tons of sulphate of ammonia per day. Analyses indicated a volatilization of 71 p.ct. of the phenols and a reduction in the figure for oxygen absorbed of 42 p.ct.

This method, however, can only remove the volatile phenol (C_6H_5OH) and not the higher tar acids, and thiocyanate and thiosulphate are not affected. Further, spent liquors from all works are not decolorized by the process, and in any case the colour is only removed temporarily, for on mixing with sewage or streams the acidity gradually disappears and the colour returns. Vertical retort spent liquors contain large proportions of higher tar acids, so that the maximum possible improvement in the liquor cannot be so great as that obtained at Hornsey with horizontal retort liquor. For example, with mixed effluent liquor of the composition given on p. 102 of the "JOURNAL" for July 13, if 70 p.ct. of the volatile phenol were removed, the figure for oxygen absorbed would be reduced from 1074 to 799 parts per 100,000, equivalent to an improvement of only 25 p.ct.; and this would be achieved at considerable cost in steam.

6. *Extraction of Phenol from Spent Liquor or Ammonia Liquor by Solvents.*—The literature contains many references to processes devised and patented for the extraction of phenol from spent liquor and ammonia liquor by solvents and absorbents.

In the installations described by R. M. Crawford (J.Ind. and Eng. Chem., 1926, **18**, 313) crude ammonia liquor flows downwards in series through two extractors, and commercial benzole (or motor fuel) flows in a reverse direction. The benzole (containing phenol, &c.) is afterwards sprayed in series through two towers containing solutions of caustic soda, and the liberated benzole is recirculated. The sodium phenolate solution obtained also contains cresols, higher tar acids, benzole, pyridine bases, naphthalene, &c. Benzole, pyridine bases, and naphthalene are removed by steam distillation. A portion of the circulating benzole is removed continuously from the system and sent through an extractor containing dilute sulphuric acid, to remove pyridine bases. The pyridine sulphates are removed, and replaced periodically by fresh acid.

The free phenols are liberated from the steamed phenolate solution by sulphuric acid or carbon dioxide.

Analysis of Crude Phenol, P.Ct. by Volume.

Water	12
Phenol	51
Cresols	26
Higher acids, &c.	11

Requirements per 1000 Gallons Liquor containing 0·2 P.Ct. Phenol by Weight.

Caustic soda	14 lbs.
Carbon dioxide	9 ,,
Benzole (loss)	5 ,,

Products.

Sodium carbonate	18 lbs.
Crude phenols	16·6 ,,

Installations of the type described by Crawford have been erected at the works of the Hudson Valley Coke and Products Corporation, Troy, N.Y., the National Tube Company, and the Iroquois Gas Corporation.

A description is given in the "Gas World," Coking Section (July, 1926, pp. 20-22), of a plant which has been erected at Hattingen by the Bamag-Meguin A.G. for the recovery of phenol by benzole washing. The ammonia liquor flows through coke filters to remove tar, is preheated to 65° C. by benzole vapours from the still, and flows to a mixing pump, where it admixes with benzole partly enriched with phenol, and thence to a separating tank. The liquor passes to a second pump to mix with clean benzole, and then passes, after separation, to the ammonia still. The benzole-phenol mixture is heated to 80° C. in a distillation apparatus, the benzole vapours being passed through a rectifying column and dephlegmator, and cooled by incoming liquor. The phenol tar remaining is distilled to remove the last traces of benzole. With a crude liquor containing 0·3 p.ct. of phenol, it is stated that a recovery efficiency of about 75 p.ct. is obtained. A statement of costs given shows a net profit of 14 p.ct. on capital investment, but no allowance seems to have been made for the loss of benzole, which must result from its solubility in liquor.

P. Francke (Chem. Zeitung, 1925, **49**, 325) has also described a process for the recovery of phenol from ammonia liquor or spent gas liquor by means of benzole. The process is said to be profitable with liquor containing 0·5 p.ct. phenol. Trichlorethylene, which is non-flammable, and less soluble in water than benzole, may also be used as a solvent.

According to a process by L. W. Heffner and W. Tiddy (B.P. 244,774, 1925) ammonia liquor is distilled under certain conditions, and volatilized phenols are absorbed in a washer containing lime, caustic soda, active carbon, or other medium.

D. W. Parkes (J.Soc.Chem.Ind., 1927, **46**, 186T) has described the results of laboratory experiments in which phenols are removed from effluent gas liquors by means of activated carbon.

7. *Evaporation of Spent Liquor.*—Evaporation to dryness is one method of disposal of spent liquor, but unless sufficient waste heat is available for the purpose this method must be expensive in fuel. For example, assuming the volumes of spent liquor from vertical retort systems to be 76·5 gallons per ton of coal carbonized and 5700 gallons per ton of ammonium sulphate, 96 lbs. of solid fuel would be required per ton of coal carbonized, or 7125 lbs. (3·18 tons) per ton of sulphate, on the basis of 8 lbs. of liquor evaporated per lb. of fuel. This amount of fuel, 96 lbs. per ton of coal carbonized, is approximately 35 p.ct. of the weight of fuel ordinarily used in the producers for heating the retorts. At some coke oven installations spent liquor is evaporated by use in the quenching of coke. Objection to this procedure has at times been raised. It has been stated that spent liquor depreciates the value of the coke. Another suggested objection, which applies to all methods of evaporation, is that injurious vapours are emitted into the atmosphere; but inquiries have failed to indicate any detrimental effect from this cause, on either health or vegetation.

In some gas-works the "devil" liquor, the volume of which is from 10 to 15 p.ct. of the effluent liquor, is evaporated by injection in the form of a fine spray into the base of a hot chimney. This procedure avoids the expense of additional fuel, and reduces the difficulty of purification by an amount greater than that equivalent to the volume of "devil" liquor, since the oxygen-absorption figure of "devil" liquor is much greater than that of still effluent. For example, the oxygen-absorption values of the effluents from the distillation of ammonia liquor from a particular installation of continuous vertical retorts were 990 parts per 100,000 of still liquor and 1635 parts per 100,000 of "devil" liquor. Evaporation of "devil" liquor in this instance would, therefore, reduce the total work of purification of effluent by 20 p.ct.

Other methods of evaporation of spent liquor which have been suggested include spraying on to a burning spoil bank or into producer furnaces.

8. *Removal of Thiocyanate from Spent Gas Liquor.*—Several methods have been devised for the partial purification of spent gas liquor by removal of thiocyanate. The processes tried on the large scale, however, have not been very satisfactory, largely because they have proved too expensive and troublesome in consideration of the comparatively small amount of purification effected. The principles are illustrated by brief descriptions of typical processes of this nature.

According to H. W. Crowther (B.P. 11,964, 1893), the spent liquor is treated with lime kiln or other gases containing carbon dioxide. Calcium carbonate is allowed to settle out, and the clear liquid is agitated with cuprous oxide to convert thiocyanate into cuprous thiocyanate. The mixture is then slightly acidified with hydrochloric acid and the cuprous thiocyanate is filtered-off and used for the preparation of thiocyanate of alkali metals. Ferrous sulphate and copper sulphate have also been used in place of cuprous oxide.

In one process introduced by Radcliffe, spent liquor is heated with a solution of sulphur dioxide and calcium bisulphate made from gases leaving the saturator. A solution of copper sulphate is next added, to precipitate cuprous thiocyanate, which can be recovered by settlement.

In a process devised by Radcliffe and tried at Enfield and Wellington, acid is added to the liquor to set free the thiocyanic acid (HCNS) present. The thiocyanic acid is then removed by the injection of air and steam, and is condensed in aqueous solution.

THE GAS INDUSTRY IN GERMANY.

Points from the Association Meeting.

The Sixty-Eighth Annual General Meeting of the German Gas Association was held at Kassel from June 15 to 17. Even more than usual importance was attached to the meeting on this occasion, on account of the proposals which are on foot for the supply of practically the whole country with gas from the Ruhr coke ovens, which would, of course, involve the extinction of a large part of the gas industry as now constituted. From recent issues of "Das Gas- und Wasserfach," we are able to give some account of the proceedings.

After brief reference to the activities of the Association during the past year, the report of the Committee turns to the subject of coke oven gas. The idea of conveying it under pressure from a central source to great distances over very wide areas has long been a subject of academic discussion, but it has recently become a very real possibility with the formation of a limited liability company with a definite scheme and active propaganda. A memorandum on the subject is in course of preparation, which will set forth the considered attitude of the gas industry to the scheme.

According to the report, discussion of the subject has so far indicated a determination on the part of the industry to treat the scheme on its merits, with the object of expanding gas consumption as much as possible in whatever way appears to offer the best prospects. All the same, there is an undeniable tendency towards centralization and high-pressure supplies in one shape or another, with the closing of less profitable works in favour of larger units. Several examples are quoted of the gradual development of networks of supply about central production stations. Würtemberg is a case in point; an already existent system at Mannheim is being extended; recent developments in Hess have led to the connecting of Frankfort with Offenbach; and the Hartz district is being completely surrounded with a high-pressure system. Recently Dortmund, the last surviving gas-works of any size in the Ruhr district, has closed down, and Hagen, in Westphalia, has given up production, and is now taking coke oven gas in bulk. Two other significant moves in the same direction have been the recent acquisitions of large collieries by the German Continental Gas Company, and, jointly, by the Cologne Municipality and the Frankfort Gas Company.

At the same time, it is noteworthy that these striking developments in one direction have not prevented, in the other, the alteration and extension of existing gas-works. Even cities so near the Ruhr district as Duisberg and Düsseldorf, after full consideration of the terms upon which they are offered bulk supplies of coke-oven gas, have quite recently decided upon important reconstructions of their gas-making plant. Frankfort and Eisenau also have determined upon big alteration schemes, and entirely new works have been completed and are operating at Stettin and Minden.

EDUCATIONAL.

Whatever the prospects of the early supersession in Germany of gas-works by coke ovens, ample facilities are available, and are made good use of, for training personnel for the gas profession. In Berlin, funds are supplied to this end by the enterprise of the municipal gas undertaking, and, at the technical universities of Darmstadt and Brunswick, courses are financed by the Gas Association. At the Karlsruhe University, the courses of gas and fuel technology are run in conjunction with the Gas Institute—the research station of the Association, which is under the able direction of Prof. Dr. K. Bunte.

The educational functions of the Institute are only a small part of its work. In addition, during the year under review, coal and chemical analyses were undertaken for gas-works, working tests of plant were carried out, and a considerable amount of original research work was put through.

The Chemical Commission of the Association reports discussions during the year on various interesting subjects, to which we hope to make further reference at a later date.

LOW-TEMPERATURE CARBONIZATION OF BROWN COAL.

Further allusion to the high-pressure supply question was made in the report of the Gas Commission. At one of its meetings, Prof. Bunte had been persuaded to give his authoritative opinion as to the possibility of producing from brown coal a gas suitable for town supply. He considered that the most hopeful means towards this end is a process which is based upon a suitable splitting of the hydrocarbons, and he reported upon experiments which he is making on these lines. By reducing the heavier hydrocarbons and the higher homologues of methane in favour of a higher free hydrogen content, it would appear possible to produce a gas very similar to ordinary normal town gas. He summarized his conclusions by saying that the gas industry could employ gas from the low-temperature carbonization of brown coal by reducing its air content, washing-out the CO_2 and H_2S, and then so treating it as to reduce secondary air requirements.

The Commission had also, in the course of the year, discussed the present position of complete gasification. A contribution by Dr. Vater had summed-up the general opinion that no process yet evolved provides a satisfactory substitute for ordinary gas in respect of calorific value, specific gravity, or secondary air requirements. It is considered possible that any day may bring a satisfactory solution of the problem, since much progress has already been made.

THE MEETING.

It was a gathering of 1200 members which assembled at the Kassel Town Hall at 9.30 a.m. on the first day of the meeting, under the Presidency of Herr Kühne. The numbers, it is stated, were maintained to the very end, and the greatest enthusiasm was displayed throughout in the business on hand. Two personal episodes at the beginning of the proceedings made great appeal to the members. Herr Leonard Körting, who served the Imperial Continental Gas Association for so many years, and who can claim to be doyen of the gas industry of Germany, if not of the world, mounted the rostrum and addressed the assembly. Then Prof. Junkers, detained until the last minute by the presence in Dessau of the President of the Republic, arrived in one of his own aeroplanes, in order not to miss the great annual event of the German gas industry, which, high as are his scientific achievements in many directions, he still considers his closest tie.

Representatives were present at the meeting from the gas associations of Denmark, Holland, Sweden, Switzerland, and Czecho-Slovakia, and from a very large number of other German technical associations, including the electrical industry.

THE COKE OVEN GAS SCHEME.

There was naturally allusion to this in the President's speech. Herr Kühne emphasized the fact that the Association, representing as it does the gas industry as at present constituted, had conceived as its duty an impartial investigation of the proposals, from a practical point of view, and as fully as possible. They must not only examine what the coke ovens have to offer, but also decide what prospect there is of the glowing promises being fulfilled. If it should be proved that they really can give a supply of suitable gas with the necessary certainty, and at much lower prices than the present gas-works, even with all modern developments, then coke-oven gas will come. But only under these conditions, and for an absolute certainty, can towns and cities afford to discard from their hand the trumps which they at present hold in the shape of established gas undertakings.

On the same subject Herr Müller delivered an address which, in the words of the President, sums-up the present considered opinion of the Association, though, on a matter of such moment, it cannot be regarded as a final judgment. After shortly reviewing the progress of the industry up to its present high state of development, the speaker set himself to analyze certain aspects of the coke oven gas proposals. What, he asked, are the essentials for the economic working of a huge centralized high-pressure supply, and is the proposed Ruhr scheme practicable? Is it possible to exploit the other coalfields of Germany, including the brown coal deposits, in the same way? What is to be the advantage, first to the coal interests, and secondly to the towns, which own nearly all the gas-works in Germany? And what would be the effect generally upon German industry?

Herr Müller's most interesting conclusion, based upon a wealth of statistical and detailed information, was that a universal reduction in the selling price of gas would not be possible. On the contrary, only the comparatively small proportion of the population would benefit at all which is at present supplied from small uneconomically producing gas-works. In view of this, it would be difficult to justify a capital outlay which the speaker estimates at not less than twenty millions sterling. Unless the big cities alter their expressed intentions on no account to contemplate the closing of their gas-works, the huge scheme of the coal syndicate is doomed to failure. It appears, however, that the coal interests are now contemplating an alternative line of advance, in which they propose a joint financial interest with the existing gas undertakings; these either continuing as gas producers or becoming retailers of crude coke oven gas supplied in bulk, which would receive further treatment at the works. The result of these new tentative proposals cannot yet be foreseen. The possibilities attaching to the latter alternative were the subject of another paper, with which Herr Borchardt greatly interested the meeting.

UNIFORMITY OF GAS QUALITY.

Other papers included one on this subject by Prof. Dr. K. Bunte. He referred to the great coal shortage (almost, he said, unthinkable in these days of glut) of the years 1919 to 1921, and the manner in which the industry in Germany applied itself, when the situation improved, to putting its house in order. To this end, and to facilitate the transition from old

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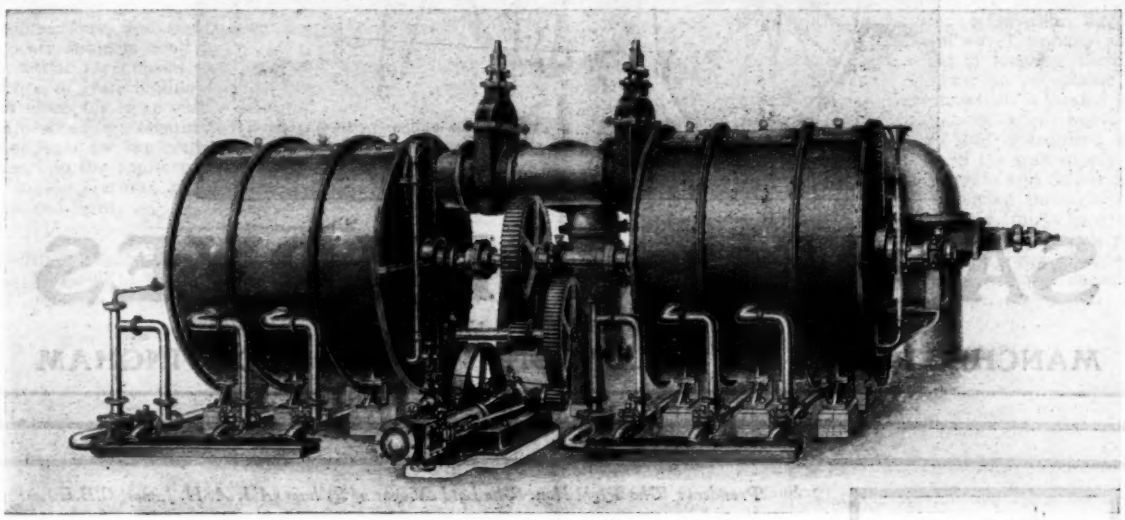

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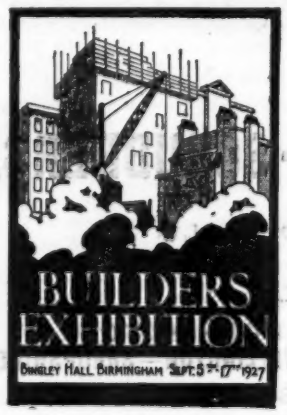

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Full Particulars from

The Exhibitions Director, The Chamber of Commerce (Inc.), Birmingham.

standards, or no standard at all, to calorific value, the German Gas Association drew-up a series of recommendations as to gas quality. These regard as "normal" a mixture of coal gas and water gas having a calorific value of 4200 cal. [470 B.Th.U.] with a margin of 100 cal. on either side. Inerts (N_2 and CO_2) should not exceed 15 p.ct., and specific gravity 0·5. In addition, there are certain specifications as to purity.

These standards allow, as Dr. Bunte points out, a good deal of latitude to suit local requirements, and they do permit, wherever they are adopted, of the use of consumers' apparatus of good construction without drastic adjustments. Statistics show that they have received very general acceptance and have given general satisfaction. Dr. Bunte, however, stresses the importance of a regularity of quality for each individual works well within the permissible limits of the recommendations; practically every complaint of "bad gas" is, in his opinion, really a complaint of irregular quality. In the best organized works, regularity is developed to a remarkable degree, and coke oven supplies, if they come, will be expected to live up to a high standard in this respect.

Other Business.

Papers were given by Herr Schumacher, of Frankfort, on "Production and Distribution Costs," and Dr. R. Biel, of Berlin, on "Resistance to Gas Flow in Mains." To these, as well as to the papers abstracted above, we hope to make fuller reference at a later date. Standardization of meters and connections, and combustion fumes from gas apparatus, were other subjects dealt with.

The ballot for officers for the ensuing year resulted in the re-election of Herr Kühne as President. Hamburg was chosen as the place for next year's meeting.

The proceedings terminated with the usual votes of thanks, and not least for the contribution of the municipal authorities of Kassel to the comfort and success of the meeting. At this crisis in the German gas industry, its Association is full of vitality and fight.

Society of British Gas Industries.—From the Secretary (Mr. Arthur L. Griffith) we have received a copy of the rules and list of members revised up to the present month.

The Urbain Plant at Nanterre.

We learn from the "Journal des Usines à Gaz" that during the recent Annual Gas Week a visit was paid to the Nanterre Gas-Works, where an Urbain activated carbon plant for the recovery of benzole has been at work for nine months. There are four pre-absorbers and four main absorbers; and it is a remarkable fact that the first run of benzole is of a quality which permits of its sale and utilization without washing or rectification. The visitors were greatly impressed by the neatness, simplicity, and cleanliness of the installation, which requires no pumps or other mechanical parts, and only one tank—that for the recovered spirit. At Nanterre, figures relating to a make of 85,000 cub.m. show that only 0·7 to 1 gramme of benzole remain per cub.m. of gas; and this for a steam consumption of 3 to 3·5 kg. per kg. of benzole recovered.

Gas Boiler for Heating Pullman Cars.

At Danville (Ill.), Pullman cars are being heated by the aid of gas. Mr. R. D. Hays (Industrial Gas Engineer to the Illinois Power and Light Corporation) tells the readers of the "American Gas Association Monthly" that several months ago the Wabash Railway Company asked for help in solving the problem of heating a Pullman car that arrives at Danville every evening about 9 o'clock, and is switched to the Wabash line to be taken to Detroit, leaving Danville at 11.10. In the interval, the car stands on the tracks at the Wabash Station. As there was no provision for heating other than having a locomotive coupled to the car, the Railway Company sought for a better and less expensive method of keeping their passengers comfortable. By the aid of gas, an acceptable solution has been found. The heating plant, which is located in the basement of the railway station, consists of a gas boiler fully equipped with automatic controls. All that is required of the attendant is to open and close a valve in the gas supply pipe. The function of the gas boiler is to generate and deliver steam at 14 lbs. pressure. The steam is conducted through an insulated pipe under the station platform and tracks to a steam cock located near the track where the Pullman coach stands while in the station. Though the system was designed to heat only one car, it has proved to be of sufficient capacity to serve as many as three.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

The Sign of the "Blue Star."

SIR,—I have read with a great deal of interest an article entitled "The Sign of the Blue Star" in the June 8 issue of your magazine. In the beginning, permit me to thank you for the many complimentary references made therein to the purposes and accomplishments of our Institution.

I was particularly interested in the two questions raised in the latter part of your article—namely, (1) whether any steps have been, or can be, taken to prevent fraudulent use of the "Blue Star" for appliances that have not been subjected to the laboratory's tests; and (2) whether there is any danger of the "Blue Star" damaging business in different grades of the same appliances. I will comment on these questions in the order that they are listed.

When a manufacturer submits an appliance for test, he completes an Application for Test form, which sets forth the rules and regulations under which the tests will be conducted, and the manner in which his appliances will be listed, providing they satisfactorily pass our various approval tests. Our Certificates of Approval also provide that approved appliances must be identified with the Approval Seal. We supply our membership each month with supplementary lists of approved appliances; and all of our member companies have on file one or more complete lists of appliances approved by the laboratory. Our regulations governing the method of listing appliances also provide for publishing any infraction of our rules. In other words, if any manufacturer is found violating his agreement with us, we would surely notify our members through our various publications at once. As an added precaution, of course, our Approval Seal is copyrighted.

The laboratory maintains a corps of inspectors to examine all approved appliances and see that the rules and regulations governing their approval are carried out in every respect. These men are constantly on the alert for any infraction of our rules. Further than this, we find that the manufacturers themselves are very efficient inspectors, as they are continually studying competitive products; and whenever it is found that misrepresentation is being practised, they are the first ones to notify us. Fortunately, we have had very, very few instances of this kind.

Our testing standards, or "approval requirements" as they are called, are minimum requirements for safe and efficient performance and reasonably durable construction. Our members and the trade know, and are advised of, the fact that our requirements are minimum standards; and we are frank to admit, if questioned, that appliances are manufactured which exceed these requirements. For example, our standards do not specify that a gas range must be equipped with an oven heat regulator, although we have approval tests for them providing they are supplied. This means, therefore, that all appliances bearing the "Blue Star" Seal of Approval do not necessarily possess the same merits. Further, we always encourage purchase of the highest quality of appliance that the customer can afford. In passing this point, however, it should be borne in mind that, after all, the performance of the appliance is the most important item; and we are most interested, first, in a reasonable figure of efficiency and a high factor of safety governing completeness of combustion. Matters of construction, we believe, are of secondary importance; and where accessories or added convenience factors are supplied, they should justify themselves from a commercial standpoint. Generally speaking, it is proven that they do.

I appreciate very much the publicity you have given our laboratory. We believe that its establishment was one of the most important steps ever taken by the American gas industry in the interests of better public service.

R. M. CONNER,
Director, Testing Laboratory, American Gas Association.

Foot East 62nd Street, Cleveland, Ohio,
July 6, 1927.

Premature Holing of Silica Retorts.

SIR,—In the letter of your correspondent published in your issue of July 6, there are certain statements which are by no means correct, and two inferences at least which are accordingly unjustifiable. The real facts are:

(1) The admirable report by Messrs. Corfield and Diamond was not suppressed by the Research Association.

(2) The text of the paper itself was not abbreviated. The only abbreviations were in the discussion, which was a particularly lengthy one.

(3) In the shorthand transcript of the discussion which was placed at my disposal, the speakers were indicated by numbers. My instruction was that this is the general practice of the Eastern Section of the Southern Association.

The implications suggested by your correspondent, based on misstatements of the above facts, are apt to create wrong impressions, just at a time when the British Refractories Research Association is seeking additional support for investigations on the refractory problems of the gas and other user industries.

A. J. DALE, Technical Secretary.

British Refractories Research Association,
North Staffordshire Technical College,
Stoke-on-Trent, July 18, 1927.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

Birmingham Extension Bill: Reported from the Select Committee, with amendments.

Bognor Gas and Electricity Bill: Returned from the Commons, agreed to, with amendments, which were considered and approved.

Colwyn Bay, Conway, Earl-Shilton, East Hull, Exeter, Ipswich, Manchester, Portsmouth, Redditch, St. Ives (Hunts.), Walton-on-Thames and Weybridge, and Wellington (Somerset) Gas Orders: Referred to the Special Orders Committee.

Companies Bill: Read the third time; amendments made. Bill passed, and sent to the Commons.

Greenock Burgh Extension Bill: Reported, with amendments.

Smethwick Corporation Bill: Returned from the Commons, with the amendments agreed to.

West Bromwich Corporation Bill: Reported from the Select Committee, with amendments.

Kilmarnock Gas and Water Order Confirmation Bill.

A Bill to confirm a Provisional Order under the Burgh Police (Scotland) Act, 1892, relating to Kilmarnock Gas and Water was presented on July 14 by the Duke of Sutherland, read the first time, and referred to the Examiners.

HOUSE OF COMMONS.

Progress of Bills.

Bognor Gas and Electricity Bill: As amended, considered; read the third time, and passed, with amendments.

Colwyn Bay, Conway, Earl-Shilton, East Hull, Exeter, Ipswich, Manchester, Portsmouth, Redditch, St. Ives (Hunts.), Walton-on-Thames and Weybridge, and Wellington (Somerset) Gas Orders: Copies presented.

Newquay (Cornwall) Gas Order: Approved, with the addition of a clause that nothing in the Order shall prejudice or affect any property, rights, powers, authorities, or privileges of H.R.H. the Duke of Cornwall, in right of his Duchy of Cornwall or of the possessor of the Duchy of Cornwall for the time being.

Scarborough Gas Company (Consolidation) Bill: Read a second time, and committed.

Smethwick Corporation Bill: Lords amendments considered, and agreed to.

South Suburban Gas Order: Approved.

MISCELLANEOUS NEWS.

GAS REGULATION ACT APPLICATIONS.

Smethwick Corporation.

After the declared date, the maximum price in respect of gas supplied by the undertakers shall be 12·8d. per therm. (July 7.)

SPECIAL ORDER.

East Hull Gas Company.

To authorize the Company to purchase by agreement the undertaking of the New Hedon Gas and Coke Company, Ltd.; to extend the limits of supply; to make provision as to the price chargeable within the added limits; and to enable the Company to use scheduled lands for gas purposes.

HALIFAX GAS COLLEGE SUCCESSES.

Successful Students in the Recent Examinations of the Institution of Gas Engineers.

In the recent examinations of the Institution of Gas Engineers in Gas Engineering and Gas Supply, the following successes have been gained by students of the Halifax Gas College:

Gas Engineering.

Diplomas	2
Higher	2 (First Class with Distinction)
"	5 (First Class)
"	3 (Second Class)
Ordinary	3 (First Class)
"	12 (Second Class)

Gas Supply.

Higher	1 (First Class)
Ordinary	1 (First Class with Distinction)
"	6 (First Class)
"	2 (Second Class)

In other words, 35 out of the 69 external certificates awarded. These represent 86 p.ct. of the number of students submitted by the College.

VISIT TO THE READING GAS-WORKS.

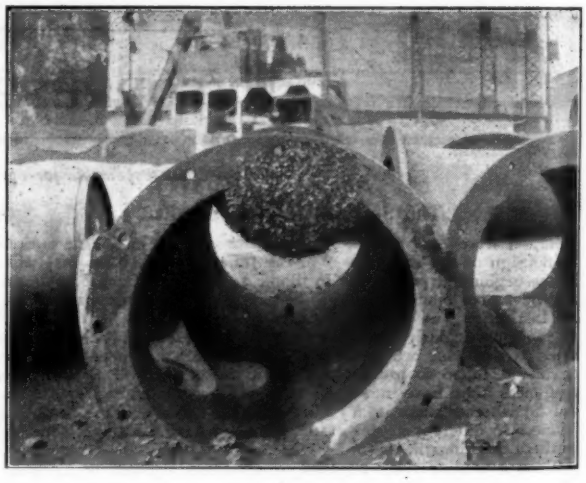
Mr. D. H. Helps and the Company's Growth.

Recently a number of stockholders in the Reading Gas Company, and their friends, visited the gas-works, to inspect the new plant which is being installed there. Mr. D. H. Helps (Engineer and Manager), in welcoming the visitors on behalf of the Directors, explained that, though they had a large number of stockholders, few attended their annual meetings; the reason no doubt being that the Company had paid maximum dividends ever since its inception in 1862, and the stockholders had no cause for anxiety. The Directors, however, felt that a visit to the works would be of interest. The new capital for which tenders were now being asked was required to meet the expenditure in connection with the extensive additions to the manufacturing plant rendered necessary owing to the continued and increasing demand for gas indicated by the following figures: 1916, sale of gas, 747,359,600 c.ft., number of gas cookers and fires on hire, 23,883; 1926, 1,129,524,300 c.ft., and 33,032.

The amount required to pay interest charges and a maximum dividend for the year 1926 was 1·08d. per therm. The margin between the present price charged for gas and the maximum price authorized, together with the Company's reserve fund, afforded ample security to investors. The reserve fund of £27,000—the maximum amount authorized under the Company's 1902 Act—was invested in Government securities; and at Dec. 31, 1926, the balance of net profit carried forward after providing for the statutory dividend was £27,523. Under the provisions of the Reading Gas Act, 1927—which had just received the Royal Assent—the reserve fund might be increased by a further sum of £26,809.

BEES SWARM AT LEEDS GAS-WORKS.

On Monday, July 11, an army of bees 25,000 strong invaded the Leeds Corporation Gas-Works in Meadow Lane, and for a time held up the work there, as employees refused to go near the place where the bees had swarmed. The Under-Manager, Mr. Newham, noticed a cloud of bees circling over the yard; and then, to his surprise, they alighted on the end of a 30-in. pipe. For a few minutes they covered the end like a curtain of beads; but they were disturbed, and bunched themselves together on the inside of the pipe. Mr. F. Bell, who is employed in the laboratory at the works, is a beekeeper; and he agreed to hive the swarm, which he accomplished successfully.



The curious thing is that the Meadow Lane Works are more than half-a-mile from any district where bees can be kept, and it is unusual for them to move any great distance in swarming. The only explanation Mr. Bell can think of is that they were attracted by a big holder which has just been painted light stone colour. Previously it was black; but the City Gas Department has embarked on a "brighter Leeds" movement. In this latter connection our local correspondent writes: "Mr. C. S. Shapley (the Leeds City Gas Engineer and General Manager) is contributing the quota of his department to a 'brighter Leeds' by his decision (supported by the Gas Committee) that the repainting of the gasholders—now proceeding—shall be in light stone colour, instead of the darker colours usual for such work. The view is that the people living in the vicinity of gas-works need all the sunshine that can possibly reach them, and that light-painted holders are likely to reflect a certain amount as well as to afford some brightening of the locality from a merely æsthetic point of view. The people in the neighbourhood of the Kirkstall Road and Sheepscar Works, already painted in this way, have expressed their hearty approval."

Bees do not as a rule swarm in an uncongenial atmosphere; and therefore the incident may be regarded as a testimonial to the purity of the air at the Meadow Lane Gas-Works.

Reduced Price at Kenilworth.—A reduction of 4d. per 1000 c.ft. in the price of gas has been notified at Kenilworth, to take place from the current meter readings. The net price of the gas is thus 4s. 4d. per 1000 c.ft., or 1s. 1d. per therm.

1,000,000 TONS OF COAL

were saved last year in the United Kingdom by the use of

KIRKE PATENT WASTE HEAT BOILERS

If YOU have heat going to waste, we can turn it into profit just as we have done for some of the largest Gas Companies, Collieries and Steel Works in the country.

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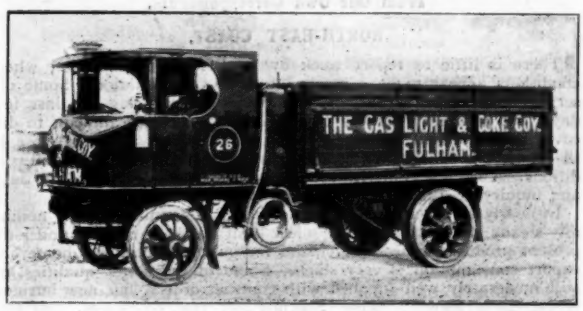
Telegrams: "BONECOURT, PHONE, LONDON."
Phone: VICTORIA 2802-3.

o & s

COKE FOR STEAM LORRIES.



Popularizing coke for steam-lorries is a fruitful subject of discussion. The above photographic reproduction shows a new addition—the "Sentinel"—to a coke-carrying fleet. Interesting features are the three-way tipping and the high sides.

TRADE NOTES.

"Vortex Supreme" Separators.

Messrs. William Alexander, of 167, Vincent Street, Glasgow, have published an illustrated booklet describing their "Vortex Supreme" separators (Alexander's patents) for removing solid and liquid impurities from air, gas, and steam.

"A. & M." Controllers for Boston.

The Town Council of Boston (Lincs.) have decided to renew the majority of their public lamps, and to instal the "A. & M." pressure-wave controller throughout the town. Messrs. Alder & Mackay, Ltd., have been instructed to supply their "Edinburgh" pattern street lanterns and 286 "A. & M." controllers.

Hot Water Service and Heating Equipment.

Bearing this title, a new illustrated catalogue has been published by Messrs. Thomas Potterton, Cavendish Works, Ravenswood Road, Balham, S.W. 12. In it are described the various types of gas-heated hot water boiler they manufacture. The booklet contains much practical information on the design of hot water supply. Features of special interest are their new "R" series of gas boilers, and their calorifiers for indirect hot water supply.

CONTRACTS OPEN.

Coal.

Tenders are invited by the Prestatyn Urban District Council for the supply of screened gas coal or nuts. [See advert. on p. 183.]

Gasholder.

Tenders are invited by the Ramsgate Corporation for the supply and erection of a small gasholder. [See advert. on p. 183.]

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *July* 18.

Pitch remains quite steady at 85s. per ton, and some business has been booked at this figure. There seems to be little available for shipment early next season. Creosote is also steady at about 8¼d. to 8¾d. per gallon; but there is very little of either of these products being made at present, owing to the bulk of the material being delivered as road tar.

Other products in the London market remain unchanged.

Tar Products in the Provinces.

July 18.

Markets for tar products remain firm. It is evident that the disappointing quantities of crude tar being received from the coke ovens, in conjunction with the very large quantities of refined tar going on the roads, is causing a shortage in tar products generally; and this will probably remain until the end of September at any rate.

Pitch is firm; 83s. 6d. having been paid for prompt delivery and 82s. 6d. for forward. There are reports that in special cases 85s. has been paid for forward delivery.

Creosote oil is firm. There is a large home demand; while export oil is going forward freely.

Water-white products are quiet, owing to the low prices at which petroleum products are offered.

Crude carbolic is firm, and prices are being well maintained. Crystals carbolic are steady; cresylic acid is in fair demand; naphthalene is quiet; and anthracene is still purely nominal.

The average values of gas-works products during the week were: Gas-works tar, 60s. to 65s. Pitch—East Coast, 82s. 6d. to 85s. f.o.b. West Coast—Manchester, 77s. 6d. to 80s.; Liverpool, 80s. to 82s. 6d.; Clyde, 81s. 6d. to 84s. Benzole, 90 p.ct. North, 1s. 2d. to 1s. 3d.; crude, 65 p.ct. at 120° C., 10¼d. to 10½d., naked, at makers' works; 50-90 p.ct. naked, North, 1s. 3d. to 1s. 4d. Toluole, naked, North, 1s. 4d. to 1s. 5d. nominal. Coal-tar crude naphtha, in bulk, North, 7½d. to 8d. Solvent naphtha, naked, North, 11d. to 1s. 0½d. Heavy naphtha, North, 1s. to 1s. 1d. Creosote, in bulk, North, liquid, 7¼d. to 7½d.; salty, 7d. to 7¼d.; Scotland, 7¼d. to 7½d. Heavy oils, in bulk, North, 8¾d. to 9½d. Carbolic acid, 60 p.ct., 2s. 4d. prompt. Naphthalene, £11 to £14; salts, £5 to £5 10s., bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

COAL TRADE REPORTS.

From Our Own Correspondents.

NORTH-EAST COAST.

There is little to report week by week from this market, where conditions appear to have reached a state of stagnation. Some observers profess to have found a steadier tone during the last few days, but concrete instances of any improvement are difficult to discover. The official summary issued to the Press after the close of the market each day tells an unvarying story of exceedingly dull conditions. Very few collieries are finding it possible to work full time, and inquiry is still very limited indeed.

In nearly all cases it may be said that prices remain merely nominally steady only because the absolute limit has been reached under the present production costs. Demand for gas coals both for home and export consumption is very slack. Some of the better qualities are still moderately well supplied with contract orders, but new business is extremely slow. Wear Specials ask 16s. 6d. f.o.b., and best qualities quote 16s. to 16s. 3d. Seconds are nominally 14s. to 14s. 6d., but a large number of brands can be bought at 13s. 6d. Unscreened coking coals are on offer down to 13s. 6d., and Durham bunkers are 13s. 9d. to 14s. 3d. for ordinary makes, and 14s. 6d. to 14s. 9d. for bests. Best large Northumberland steams are no better than 14s. 3d., and even at this price are not fully supplied with trade.

Gas coke is clearing fairly well, with 19s. to 19s. 6d. f.o.b. as the quotation for shipment.

YORKSHIRE AND LANCASHIRE.

Gas coal contracts in Yorkshire and Lancashire are being fixed at very low figures, and there is much competition for this class of business owing to the lack of orders for export. Owing to this situation, an effective weapon has been placed in the hands of the gas coal buyers, who have not been slow to take advantage of it. Much of the fuel thus placed is not, it is declared, fetching the cost of production.

There is a better tone in the export market, but nothing has occurred to influence the volume of tonnage.

The industrial section is not at all bright, although some qualities are showing an improvement over the slump figures recently taken. Some buyers are placing a little fuel in stock, but this is not being done to any great extent.

The following are the Humber bunker and export prices, f.o.b. usual shipping ports: South Yorkshire—Hards, Association, 15s. 7½d. to 15s. 9d.; screened gas coal, 15s. 6d. to 16s.; washed trebles, 17s. 6d. to 18s.; washed doubles, 16s. 6d. to 17s.; washed singles, 15s. 6d. to 15s. 9d.; washed smalls, 13s. 3d.; rough slack, 11s. 9d. to 12s.; smithy peas, 17s. to 18s. per ton. West Yorkshire—Hartley's, f.o.b. Goole, 14s. 9d. to 15s. 6d.; screened gas coal, 15s. to 16s.; washed trebles, 16s. to 16s. 6d.; washed doubles, 15s. 6d. to 16s.; washed singles, 15s.; washed smalls, 13s. to 13s. 6d.; unwashed trebles, 15s. to 15s. 6d.; unwashed doubles, 14s. 9d. to 15s.; rough slack, 12s. 6d. to 13s.; coking smalls, 12s. to 12s. 6d. per ton. Derbyshire-Nottinghamshire—Top hards, 18s. to 20s.; washed doubles 16s. to 16s. 6d.; washed singles, 15s. 6d. to 16s.; washed smalls, 13s. 6d. to 14s.; unwashed doubles, 15s. to 16s.; rough slack, 12s. 6d. to 12s. 9d. per ton. Yorkshire, Derbyshire, and Nottinghamshire—Screened steam coal, 14s. 6d. to 14s. 9d.; gas coke, 20s. to 23s.; furnace coke, 18s. 6d. to 19s. per ton.

Trade is quiet in Lancashire, and there is little disposition to enter into contracts. Average quotations: Best Lancashire house coal, 32s. to 33s.; seconds, 29s. to 30s.; common, 19s. to 21s.; kitchen, 22s. to 24s.; Yorkshire Haigh Moor, 26s. to 30s.; best house, 30s. to 32s.; house, 20s. to 21s.; washed doubles, 14s. 6d. to 16s. 6d.; washed singles, 13s. to 14s. 6d. into wagons at pit.

MIDLANDS.

Some of the merchants report a decidedly better turnover in house coal. It is not quite clear how far the improvement is the response to intensive efforts by individual merchants to impress their customers with the advantages of early replenishment of their cellars, and how far it reflects on general expansion of trade in this department. Some middlemen, whose operations cover wide areas, say they discern little quickening of demand for house coals.

Industrial fuel is certainly not in any better request. There is no real stringency with regard to slack, notwithstanding the reduced output. With most of the pits on short time, ordinary grades of fuel are, of course, in ample supply. Steams can be bought at 12s., pithead, up to 17s. 6d. for hand-picked. The spot lots of coal which were cumbering the market a month or so ago have been cleared for the most part. Pithead stocks are in a much healthier state, and the market is no longer disorganized (or only to a limited extent) by forced sales. There are minor fluctuations of prices, but no general changes of note.

The market for furnace cokes is calmer and steadier than at the close of the second quarter. Business is done at 13s. 6d. to 14s., ovens. Coke for miscellaneous industrial uses realizes 15s. to 16s.

Reading Gas Company.—The Directors of the Reading Gas Company are offering by tender £30,660 ordinary stock in the Company (ranking for a maximum dividend of 5 p.ct. per annum). Tender forms and other particulars relating to the new stock can be obtained at the Company's offices, and are returnable before July 28.

Price Reduction in Manchester.—The Manchester Gas Committee have decided to reduce the price of gas by 7d. per 1000 c.ft. The present price being 4s. 4d. per 1000 c.ft., it means that after the end of the current quarter, on Sept. 29, the price will be 3s. 9d., or 3s. 6d. if paid within the discount period of 28 days. Outside the city the charge will remain 3d. per 1000 c.ft. more than in the city. Before the coal strike last year the city price was 3s. 6d. per 1000 c.ft.

Consulting Engineer for Ballymena.—The Ulster Ministry of Home Affairs have sanctioned the appointment of Mr. L. Hislop as Consulting Engineer, to advise them on the Ballymena gas undertaking.

New Company.—A private company has been registered under the title of John Waterfield & Son, Ltd., to carry on business as manufacturers of, and dealers in, retorts, firebricks, &c. The nominal capital is £10,000 in £1 shares.

Torquay and Paignton Preference Stock.—The issue of £50,000 of 5 p.ct. preference stock in the Torquay and Paignton Gas Company, offered by Messrs. A. & W. Richards on behalf of the Directors, was fully subscribed, at prices ranging from £91 down to the minimum of £84 p.ct.

Price Reductions in Scotland.—At Aberfeldy the price has been reduced by 5d., making the charge 7s. 6d. per 1000 c.ft. The Fraserburgh Town Council have reduced the price from 7s. 6d. to 6s. 8d. per 1000 c.ft. The Galashiels Gas Light Company have fixed the price to ordinary consumers at 3s. 9d. per 1000 c.ft.—a reduction of 9d.

Increased Sales and Profit at Heywood.—In his annual report for the year ended March 31, Mr. W. Watmough, the Engineer to the Heywood Gas Department, states that the net profit was £4090—an increase of £2559 compared with last year. The total quantity of gas manufactured was 164,574,000 c.ft.—an increase of 12,554,000 c.ft. The total quantity of gas sold as registered by consumers' meters was 147,368,400 c.ft.—an increase of 14,889,500 c.ft., equal to 11·24 p.ct. Owing to depletion of coal stocks after weathering the difficulties of the coal strike for three months, it was necessary to purchase coal in the open market; and the price of gas was increased 3d. per 1000 c.ft. from Sept. 29. As the dispute was prolonged and fuel prices continued to increase, it was decided in November to make a further increase of 9d. per 1000 c.ft., to meet the deficit during the present financial year. The exceptional increase in gas sales, and the comparatively small increased cost of fuel, has enabled the Committee to reduce the price of gas by 1s. per 1000 c.ft.—9d. to operate from March 31, and a further 3d. from the end of the current quarter.

Welsbach Light Company, Ltd.—The report of the Directors for the year ended March 31, which will be submitted at the meeting next Tuesday, July 26, states that the trading results represent an improvement over those of recent years, notwithstanding the disturbance of trade arising from the general strike and coal strike, which led to restrictions in lighting and heating—such restrictions operating during a large part of the Company's financial year. As a result of the international trading arrangements referred to in the last annual report, there was a slight improvement in the average price realized on the sale of the Company's mantles, though this was offset by increased cost of raw materials. Early in the season —viz., on Oct. 29 last—the Company's freehold depôt at Leeds was almost entirely destroyed by fire. The premises, which were covered by insurance, are in course of being rebuilt, and are expected to be ready for occupation within the next month or so. Pending rebuilding, temporary accommodation was secured in Leeds; but the Company's trade in that important district has inevitably suffered dislocation and diminution by reason of the fire. Business in sundries —gas, electric, and oil—has continued to expand, notwithstanding the disturbing elements above mentioned. During the year, £4639 debenture stock has been redeemed, reducing the amount of stock outstanding at March 31 to £46,282, as compared with the original amount of £240,000. The balance to credit of profit and loss account for the year ended March 31 is £6619; and adding the balance brought forward there is a disposable total of £17,219. Out of this the Board recommend the payment of a dividend of 5 p.ct. (less income-tax), which will leave a balance of £4323 to be carried forward.

Wimbledon Corporation Visit the Wandsworth Gas-Works.—The Wimbledon Corporation visited the Wandsworth Gas-Works on June 24. The Chairman of the Company (Mr. F. H. Jones), after the tour, addressed the visitors in the H. E. Jones Memorial Institute, saying that the Company felt highly honoured by the Corporation's visit. The Mayor (Alderman A. W. Hickmott) said that it was a great pleasure for the Corporation and himself to accept the invitation to visit Wandsworth Gas-Works. He was Chairman of the Corporation's Electricity Committee, but he felt that there was room in the world for both gas and electricity. It was up to electricity and gas people to pull together and maintain a friendly spirit. They ought not to look upon one another as opponents, but ought to work together in the public service. Alderman Shirl Mussell, Chairman of the Watch Committee, complimented the Wandsworth Gas Company on the way in which they had overcome their difficulties during the strike last year. It was good to know that Wimbledon was supplied by a Company which gave such value as they did. Mr. H. E. Smith (Town Clerk) said that every Corporation official appreciated highly the Gas Company's Chief Engineer, for whom they had great respect personally, and held in high esteem as a very capable engineer. It was evident that Mr. Croft was supported by a loyal and efficient staff; and while these conditions obtained, the Gas Company would go on from prosperity to prosperity. Mr. C. M. Croft said that they all appreciated Alderman Mussell's remarks on how the Company served Wimbledon. They always did what they could, and were proud of successfully maintaining their full services during the troubles last year. Everybody, he remarked, was convinced that there was room for both gas and electricity. In one town in Germany which he had visited, the Corporation ran the gas and electricity undertakings, and both were expanding side by side.

Employees of the Wolverhampton Gas Company journeyed to Blackpool on July 9 for their annual outing. After dinner, Mr. A. Coombe (Fittings Superintendent) thanked the Directors and Manager for having provided the funds. In reply, Mr. Round said that the arrangements for the outing were everything that could be desired.

STOCK MARKET REPORT.

THERE were signs last week that public interest in the stock markets was broadening, but transactions were mostly confined to industrial shares. The account was completed without any apparent difficulty, and hopes are expressed that business during the holiday season will continue on a satisfactory scale. The investment stocks, though firm, were not prominent; and the numerous new issues, of which large parcels have been left with the dealers, seriously affected transactions. Colonials were in fair demand, and the New South Wales 5½ p.ct. and the New Zealand scrip improved slightly.

In the Foreign Market, Austrian 6 p.ct.'s were supported; but the serious situation which has arisen in Vienna is certain to affect the market.

With the publication of the figures of the "Big Five" banks, revealing individually and collectively a very satisfactory position, the shares were firm, and are likely to remain so.

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf.Yr	Dividends. Last Hf. Yr.	NAME.	Quotations. July 15.	Rise or Fall on Week.	Transactions. Lowest and Highest Prices.
£			%p.a.	% p.a.				
171,978	Stk.	Feb. 10	5	5	Aldershot 5 p.c. max. C.	70—78	..	..
323,993	,,	,,	4	4	Do. 4 p.c. Pref.	68—71	..	..
1,451,868	,,	Apl. 7	6½	7	Alliance & Dublin Ord.	84—87	..	84½—85½
374,000	,,	July 14	4	4	Do. 4 p.c. Deb.	64—67*	—1	..
523,654	,,	—	—	—	Barnet Ord. 7 p.c.	101—104	..	..
300,000	1	Apl. 28	1/7½	1/7½	Bombay, Ltd.	1—1½	..	..
170,000	10	Mar. 10	8½	8½	Bournemouth 5 p.c.	12½—13½	..	..
600,080	10	,,	7	7	Do. B 7 p.c.	12½—12⅝	..	..
275,000	10	,,	6	6	Do. Pref. 6 p.c.	11—11½	..	11½—11⅝
50,000	Stk.	June 29	3	3	Do. 3 p.c. Deb.	54—57	..	..
162,995	,,	,,	4	4	Do. 4 p.c. Deb.	74—77	..	..
357,900	,,	—	—	—	Brighton & Hove 6 p.c. Con.	105—109	..	107—108
341,800	,,	—	—	—	Do. 5 p.c. Con.	92—95	..	..
1,387,500	,,	Feb. 24	5	5	Bristol 5 p.c. max.	86—87a	..	..
855,000	,,	Mar. 24	8	7	British Ord.	106—109	..	107
100,000	,,	June 29	7	7	Do. 7 p.c. Pref.	112—117	..	..
130,000	,,	,,	4	4	Do. 4 p.c. Red. Deb.	73—78	..	..
200,000	,,	,,	—	33/2	Do. 5 p.c. Red. Deb.	94—96	..	..
100,000	10	May 26	6	8	Cape Town, Ltd.	7½—8½	..	7½—8½
100,000	10	Apl. 28	4½	4½	Do. 4½ p.c. Pref.	6—7	..	..
180,000	Stk.	June 29	4½	4½	Do. 4½ p.c. Deb.	70—75	..	..
686,860	,,	Feb. 24	6	6	Cardiff Con. Ord.	99—102	..	..
387,880	,,	June 29	7½	7½	Do. 7½ p.c. Red. Deb.	99—102	..	..
157,150	,,	Feb. 24	5	6½	Chester 5 p.c. Ord.	86½—91½b	..	..
79,188	1	Apl. 28	†2/-	†2/-	Colombo Ltd. Ord.	29/—31/-	..	..
24,495	1	,,	1/4½	1/4½	Do. 7 p.c. Pref.	20/—22/-	..	..
221,490	1	Apl. 7	1/9½	1/9½	Colonial Gas Assn. Ld. Ord.	24/6—26/6	..	..
178,900	1	,,	1/7½	1/7½	Do. 8 p.c. Pref.	20/—22/-	..	..
1,518,380	Stk.	July 14	—	—	Commercial 4 p.c. Cap.	—*	..	..
660,000	,,	,,	—	—	Do. 8½ p.c. Cap.	—*	..	..
475,000	,,	June 16	3	3	Do 3 p.c. Deb.	56—59	..	57½
809,000	,,	Sept. 30	‡2	‡1	Continental Union, Ltd.	35—38	..	36½
200,000	,,	Mar. 10	7	7	Do. 7 p.c. Pref.	80—83	..	..
787,580	,,	Mar. 10	6½	6½	Croydon sliding scale	96—99	..	..
408,100	,,	,,	5	5	Do. max. div.	77—80	..	..
493,270	,,	Feb. 24	4	9	Derby Con.	104—106e	..	..
58,000	,,	June 29	4	4	Do. Deb.	73—75e	..	..
209,000	,,	Mar. 10	5	5	East Hull Ord. 5 p.c.	76—80	..	..
80,000	,,	June 16	5	5	Eastbourne 5 p.c. Deb.	90—95	..	..
1,008,180	10	Mar. 24	‡3	‡3	European, Ltd.	6½—7½	..	6⅝—6¾
12,747,460	Stk.	Feb. 10	5/1/4	5	Gas Light & Coke 4 p.c. Ord.	86½—88½	..	87—88
2,800,000	,,	,,	8½	8½	Do. 8½ p.c. max.	60—62	..	61½
4,187,020	,,	,,	4	4	Do. 4 p.c. Con. Pref.	76—78	..	77½—78
5,602,620	,,	June 16	3	3	Do. 3 p.c. Con. Deb.	57½—59½	..	58—59½
181,315	,,	,,	6	6	Do. 6 p.c. Br'tf'd Rd. Db.	100—103	..	102
1,642,770	,,	,,	5	5	Do. 5 p.c. Red. Deb.	98—100	..	99½—99⅝
49,000	,,	—	7½	7½	Do. 7½ p.c. Ilford Deb.	..	..	..
82,500	,,	Mar. 10	6¾	6¾	Hastings & St L. 5 p.c. Conv	90—93	..	..
268,740	,,	,,	5¾	5¾	Do. 8½ p.c. Conv.	67—72	..	..
70,000	10	Apl. 28	†10	†10	Hongkong & China, Ltd.	12—13	..	..
178,200	Stk.	Mar. 10	5	5	Hornsey Con. 3½ p.c.	67—69	..	..
1,976,000	,,	May 12	10	10	Imperial Continental Cap.	138—140	..	139½—140
293,130	,,	Feb. 10	3½	3½	Do. 3½ p.c. Red. Deb.	69—71	..	..
285,242	,,	Mar. 10	6½	6½	Lea Bridge 5 p.c. Ord.	94—97	..	..
2,145,907	,,	Feb. 24	5½	5½	Liverpool 5 p.c. Ord.	85—86b	..	..
600,000	,,	Sept. 30	7	7	Do. 7 p.c. Red. Pref.	103—105b	..	..
165,786	,,	Feb. 24	9	8	Maidstone 5 p.c. Cap.	110—115	..	..
62,480	,,	June 16	3	3	Do. 3 p.c. Deb.	50—55	..	..
75,000	5	June 16	†7	†8	Malta & Mediterranean	5—5½	..	..
541,920	Stk.	May 26	†5	†7	Montevideo, Ltd.	90—92	..	91—92
2,061,515	,,	Feb. 24	5	5	Newcastle & Gateshead Con.	74½—75½d	..	..
360,929	,,	,,	4	4	Do. 4 p.c. Pref.	68—69d	..	..
691,705	,,	June 29	8½	8½	Do. 8½ p.c. Deb.	66½—67½d	..	..
131,735	,,	—	—	—	North Middlesex 6 p.c. Con.	91—93	..	..
800,000	,,	Apl. 28	9	7	Oriental, Ltd.	100—102	..	..
188,120	,,	June 23	7½	7½	Plym'th & Ston'house 5 p.c.	102—107	..	..
414,500	,,	Feb. 24	7½	7½	Portsm'th Con. Stk. 4p.c. Std.	102—105	..	103½
286,782	,,	,,	5	5	Do. 5 p.c. max.	76—79	..	77
2,389,909	1	—	—	—	Primitiva Ord.	17/9—18/9	+1/-	16/9—18/9
282,200	100	June 1	4	4	Do. 4 p.c. Red. Deb.	84—86	..	..
600,000	Stk.	Jan. 27	4	4	Do. 4 p.c. Red. Deb. 1911	70—72	..	..
434,968	,,	June 29	—	4	Do. 4 p.c. Cons. Deb.	69—71	..	..
160,000	10	Mar. 24	6	6	San Paulo 6 p.c. Pref.	7½—7¾	..	..
125,000	50	June 29	5	5	Do. 5 p.c. Red. Deb.	46—49	..	..
270,000	Stk.	Mar. 24	5¾	5¾	Sheffield A	97—99e	..	..
412,988	,,	,,	5¾	5¾	Do. B	97—99e	..	..
1,047,000	,,	,,	5¾	5¾	Do. C	97—99e	..	..
90,000	10	May 26	4	6	South African	4—6	..	..
6,609,895	Stk.	Feb. 24	5	7	South Met. Ord.	101½—103½	..	102—103
1,895,445	,,	July 14	3	3	Do. 3 p.c. Deb.	56—59*	—1	59⅜
734,000	,,	Mar. 10	6½	6½	Do. 6½ p.c. Red. Db.	100—102	..	..
61,500	,,	Feb. 24	8½	8½	South Shields Con.	104—106d	..	..
1,243,795	,,	Mar. 10	6½	6½	South Suburban Ord. 5 p.c.	103—106	..	104½—105½
868,837	,,	June 16	5	5	Do. 5 p.c. Deb.	92—95	..	..
647,740	,,	Mar. 24	5	5	South'mpton Ord. 5 p.c. max.	74—77	..	76¾
121,275	,,	June 29	4	4	Do. 4 p.c. Deb.	71—74	..	..
250,000	,,	Feb. 24	7	7	Swansea 7 p.c. Red. Pref.	100—102	..	..
900,000	,,	June 16	6½	6½	Do. 6½ p.c. Red. Deb.	100—102	..	..
120,000	,,	Feb. 24	7½	7½	Tottenham District A 5 p.c.	107—110	..	..
882,275	,,	,,	6½	6½	Do. B 3½ p.c.	91—94	..	93
160,000	,,	,,	5½	5½	Do. 5½ p.c. Pref.	97—100	..	..
151,255	,,	June 16	4	4	Do. 4 p.c. Deb.	70—73	..	..
258,251	,,	Mar. 10	5	5	Tynemouth Con. and New Uxbridge, Maidenhead, & Wycombe 5 p.c.	71—72d	..	..
282,094	,,	Mar. 10	6½	6½	Do. 5 p.c. pref.	85—90	..	86—87
89,880	,,	,,	5	5	Wandsworth, Wimbledon, and Epsom—	88—88	..	86½
80,000	,,	July 14	8½	8½	Wandsworth A 5 p.c.	117—122*	—3	..
256,686	,,	,,	7	7	Do. B 3½ p.c.	100—105*	—2	..
426,585	,,	,,	5/19/0	5/19/0	Do. C and New	88—93*	—2	..
852,000	,,	,,	6⅝	6⅝	Wimbledon 5 p.c.	93—103*	—2	..
92,000	,,	,,	7½	7½	Epsom 5 p.c.	100—105*	—3	..
86,416	,,	June 29	3	3	5 p.c. Deb.	52—55	..	..

Quotations at:—a.—Bristol. b.—Liverpool. c.—Nottingham. d.—Newcastle e.—Sheffield. * Ex. div.
† Paid free of income-tax. ‡ For year.

In the Industrial Market, the revival of confidence brought about a big influx of business. Tobaccos were most prominent.

The Gas Market was again progressive; but there were no improvements in the quotations except in the Primitiva shares. These were in great demand, and the price rose a further 1s. to 17s. 9d.-18s. 9d. It will be observed that the quotations of the Commercial two stocks are eliminated from the list. This is a temporary suspension pending a quotation of the merged stocks as ordinary stock. Information is filtering through that the results of the various companies during the past half-year have been most satisfactory.

The following transactions were recorded during the week:

On Monday, Alliance and Dublin 85½, European 6½, Gas Light and Coke 87, 87½, 87⅝, 3½ p.ct. 61½, 3 p.ct. debenture 58, 58⅛, 5 p.ct. debenture 99½, Imperial Continental 138⅝, 139, 139½, 139⅝, 140, Montevideo 91, 92, Portsmouth 4 p.ct. 103½, 5 p.ct. 77, Primitiva 16s. 9d., 16s. 9⅝d., 16s. 10½d., 17s., 17s. 1⅛d., 17s. 3d., South Metropolitan 102, 102½, South Suburban 104½, Tottenham "B" 93, Uxbridge, Maidenhead, 5 p.ct. preference 86½, Supplementary prices, Hertford original 14, South Metropolitan 6 p.ct. preference 108½, Yorktown and Blackwater new 5 p.ct. preference 89.

On Tuesday, Alliance and Dublin 85½, European 6½, Gas Light and Coke 87, 87⅛, 4 p.ct. preference 77½, 78, 3 p.ct. debenture 58, 5 p.ct. debenture 99½, 99⅝, Imperial Continental 138½, Primitiva 16s. 9d., 17s., 17s. 1⅛d., South Metropolitan 101⅞, 102½, 102½, 3 p.ct. debenture 58⅝, South Suburban 105⅜.

On Wednesday, Bournemouth 6 p.ct. preference 11½, Cape Town 7⅞, European 6⅛, Gas Light and Coke 87. 87⅛, 87½, 87⅜, 87⅝, 4 p.ct. preference 77½, 78, 3 p.ct. debenture 58⅝, 5 p.ct. debenture 99⅝, Imperial Continental 138½, 130⅜, 140, Primitiva 17s. 1⅛d., 17s. 3d., 17s. 4½d., 17s. 6d., 17s. 7½d., 17s. 9d., 17s. 10½d., 18s., South Metropolitan 102½, 103, 3 p.ct. debenture 58⅝, Uxbridge, Maidenhead, 5 p.ct. 86, 86½, 87. Supplementary prices, Herne Bay 6½ p.ct. preference 5¼.

On Thursday, Alliance and Dublin 84½, Bournemouth 6 p.ct. preference 11⅜, Brighton and Hove 6 p.ct. 107, British 107, Cape Town 8¼, Commercial 3 p.ct. debenture 57½, Continental Union 36½, European 6½, Gas Light and Coke 87, 87½, 88, 4 p.ct. preference 77½, 77⅝, 77½, 3 p.ct. debenture 58½, 59½, 5 p.ct. debenture 99½, Imperial Continental 138½, 139, 140, Montevideo 91. Primitiva 17s. 6d., 17s. 7½d., 18s., 18s. 3d.. 18s. 4½d.. 18s. 6d., 18s. 7¼d., 18s. 9d., South Metropolitan 102½, 102½. South Suburban 5 p.ct. 105½, Southampton 5 p.ct. 76¾.

On Friday, Brighton and Hove 6 p.ct. 108, British 107, Gas Light and Coke 87½, 87½, 87⅝, 87⅜, 4 p.ct. preference 77½, 3 p.ct. debenture 58½, 59½, 6 p.ct. Brentford debenture 102, Imperial Continental 140, Montevideo 91½, Primitiva 17s. 10½d., 18s., 18s. 1½d., 18s. 3d., 18s. 6d., South Metropolitan 102½, 103, South Suburban 5 p.ct. 105, Uxbridge, Maidenhead, 5 p.ct. 86, 87. Supplementary prices, Folkestone 66½, North Middlesex 6 p.ct. preference 104½, 105. Oxford 5 p.ct. 129, 5 p.ct. preference 89, South Metropolitan 6 p.ct. preference 110.

In Lombard Street the monetary position was satisfactory. For renewing loans lenders reduced their charge to 3½ p.ct., and business was done before the close at 3 p.ct. There was no change in discount rates, although Treasury Bills were allotted at the lowest rate —£4 6s. 1·34d. p.ct.—since May 20. The fluctuations, however, since this date have been very slight.

In the Foreign Exchange Market there was a slight recovery in sterling on New York, the closing quotation being 4.85$\frac{17}{32}$. Exchanges on Belgium (34.92), Holland (12.12$\frac{1}{16}$), and Austria (34.48) moved in our favour; but Germany (20.44$\frac{3}{4}$) went slightly against us. Italian lire were firmer at 89.30. Pesetas weakened to 28.40.

Silver fell slightly to 25$\frac{7}{16}$d. per oz., there being no important purchases. Gold remained at 84s. 11$\frac{1}{2}$d. per oz.

The Bank Rate is 4½ p.ct., to which it was reduced from 5 p.ct. on April 21. The banks' deposit rate is 2½ p.ct., and the deposit rates of the discount houses are 2½ p.ct. at call and 2¾ p.ct. at notice.

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THE Gas Committee of the City of Stoke-on-Trent desire to THANK the Applicants for the Position of ASSISTANT GAS ENGINEER, which they have found it necessary to re-advertise.

THE CITY OF STOKE-ON-TRENT.
(GAS DEPARTMENT.)

APPLICATIONS are invited for the Position of ASSISTANT GAS ENGINEER. Applicants must have had a thorough Technical Training, and possess knowledge of Carbonizing in Vertical and Horizontal Retorts, with modern Machinery, and must have had Distribution Experience, both High and Low Pressure. It will be an advantage if Applicants are capable of assisting the Chief Gas Engineer in completing the centralization of gas manufacture of the City to one centre, which work is at present in progress. Preference will be given to Candidates holding a similar position, and having Experience in the controlling of men.
Salary £500 per annum inclusive.
At the end of one year, if services are satisfactory, the successful candidate will be appointed Deputy Engineer and Manager at a salary of £550 per annum inclusive.
Applications, containing particulars of Age and previous Experience, and accompanied by *copies* of Three recent Testimonials, to be delivered to the undersigned on or before Monday, the 15th of August, 1927, marked "Assistant Gas Engineer."
Canvassing Members of the Council, or Officials, directly or indirectly, will be a disqualification, AND THIS WILL BE RIGIDLY ADHERED TO.
E. B. SHARPLEY,
Town Clerk.
Town Hall,
Stoke-on-Trent,
July 18, 1927.

EXPERIENCED Draughtsman required, Manchester District, having thorough knowledge of Gas Plant and Conveyor Work. Capable of Estimating and Calculating Strengths.
State Experience, and Salary required, to No. 7759, "GAS JOURNAL," 11, BOLT COURT, FLEET STREET, E.C. 4

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CITY OF LEEDS.
(GAS DEPARTMENT.)

APPLICATIONS are invited for the position of ASSISTANT SUPERINTENDENT of the FITTING and LIGHTING DEPARTMENT, at a commencing salary of £350 per annum.
Only applicants who have been directly connected with the Distribution Department and particularly the Gas Fitting and Sales Side, will be considered.
Applications, with *copies* of recent Testimonials, to reach the undersigned not later than July 28, 1927.
C. S. SHAPLEY,
Engineer and General Manager.
City of Leeds Gas Department,
Market Hall, Leeds.

TORQUAY AND PAIGNTON GAS COMPANY.

APPLICATIONS are invited for the Position of SHOWROOM ATTENDANT, to take charge of the Torquay Showrooms of the above Company. Candidates must be thoroughly conversant with modern Showroom Methods and Salesmanship, and must be able to advise Consumers on all matters relating to gas supply and equipment.
Applications, in Candidates' own handwriting, endorsed "Showroom Attendant," stating Age, full details of Experience, and Salary expected, together with *copies* of Three recent Testimonials, must reach the undersigned not later than Wednesday, Aug. 3, 1927.
C. G. DAWSON,
Engineer and General Manager.
Gas Offices,
59, Fleet Street,
Torquay,
July 11, 1927.

TOTTENHAM DISTRICT LIGHT, HEAT, AND POWER COMPANY.

A VACANCY occurs for a District INSPECTOR to take charge of one of the Districts of the Company at a commencing salary of £350 per annum.
Applications accompanied by *copies* of not more than Three recent Testimonials, and stating Age, Qualifications, and Experience, should reach the undersigned not later than Aug. 15, 1927.
H. C. SMITH,
Chief Engineer.
639, High Road,
Tottenham, N. 17.

A NON-COMBINE Firm, Manufacturing Gas, Cooking, and Heating Appliances, require an ASSISTANT WORKS MANAGER.
Applicants must have held similar Positions, and have a thorough Technical and Practical Knowledge of the Trade.
Apply, stating Age, Experience and Salary required, to No. 7758, "GAS JOURNAL," 11, BOLT COURT, FLEET STREET, E.C. 4.

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A DANISH Civil Engineer, well introduced to all Danish Gas-Works, seeks relation with British Firms, desiring to Represent them for Denmark, especially such firms erecting or modernizing Gas-Works, also such Firms dealing in Specialities for Gas-Works and Gas Installations.
Reply to Post Box 136, AARHUS, DENMARK. Best English and Danish References

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Full particulars given in College Calendar obtainable from the REGISTRAR.

CONTENTS.

EDITORIAL NOTES.

Tar-Bitumen Mixtures 209
Profit Raiding for Rate Aiding 209
The Coke-Oven Gas Project for All Germany 210
Advertising and Methods 211
River Pollution—Two New Committees . . 211
Parliamentary Vacation—Holidays—Sale of Coke in London—Drift of the Miners' Federation—Institute of Fuel—Engineering Wages 212

Forthcoming Engagements 213
Personal 213
Electricity Supply Memoranda 213
Society of Chemical Industry—Annual General Meeting in Edinburgh 214
Manchester District Institution of Gas Engineers—
Visit to Wentworth Woodhouse 215
Business Meeting 216
Advertisers at Olympia—The Art of Publicity 217
Teachers of Gas Engineering and Gas Supply 217
Canadian Gas Association—Twentieth Annual Convention in Toronto 218
Western Junior Gas Association—
Notes Concerning an Interesting Deposit on an Underground Gas Main. By Arthur Marsden, F.I.C., M.I.Chem.E. . . . 219
The "Positive Record" Gas Calorimeter . 221
Complete Gasification: Production of High C.V. Gas 222
A Working Test of Complete Gasification . 223

CORRESPONDENCE.

Education Scheme and an Exemption . . 223

REGISTER OF PATENTS.

Coke Extracting Mechanism for Vertical Retorts—West, F. J. and E., and West's Gas Improvement Co., Ltd. 224
Distillation of Coal Tar, &c.—Meiro, A. . . 224
Manufacture of Gases—Nielsen, H., and Laing, B. 224
Applications for Patents 224

PARLIAMENTARY INTELLIGENCE.

House of Lords—
Progress of Bills 225
Special Orders 225
House of Commons—
Progress of Bills 225
Low-Temperature Carbonization . . . 225
South Staffordshire Mond Gas Company Bill 225

LEGAL INTELLIGENCE.

Hire-Purchase Agreements and Distraint—A Ruling in Scotland 226
Extension of Patents 226

MISCELLANEOUS NEWS.

Sale of Coke—Proposed Legislation . . . 227
Nottingham Gas Profits and the Rates—A Sum Equal to 4½d. in the £ 227
Metropolitan Gas Companies' Official Testings 227

MISCELLANEOUS NEWS—(*continued*).

Foundrymen's Strike at Aston—Protest Against High Wages 227
Harrogate Gas Company's Extension Scheme—Proposal to Acquire Four Gas Undertakings 228
Coal Trade Reports—
North-East Coast 231
Yorkshire and Lancashire 231
Midlands 231
Current Sales of Gas Products 232
Trade Notes 232
Contracts Open 232
Stock Market Report 233

PARAGRAPHS.

Drakes' Vertical Retorts for Preston . . . 214
Banning of Inferior Tubing 216
Coal Cleaning Conference 217
Coal Carbonization in the United States . . 223
Year's Working at Coventry 226
Lampeter Gas Company—Price of Gas Reduced at Ossett 230
Birmingham Corporation Accounts . . . 231
Leigh Gas Undertaking—Price Reduced at Bradford—Loss at Walsall—Gas Sales Increase at Colne—Mansfield Gas Undertaking—Ballymena Gas Undertaking—Reduction at Pudsey—Aberfeldy Gas Company's Dividend—Gas Light and Coke Company's Dividend—Tottenham District Light, Heat, and Power Company—Continental Union Gas Dividend—Students Inspect Dewsbury Gas-Works—A Lecture at Stafford—Taunton Gas Light and Coke Company—Price Reductions in Scotland . 232

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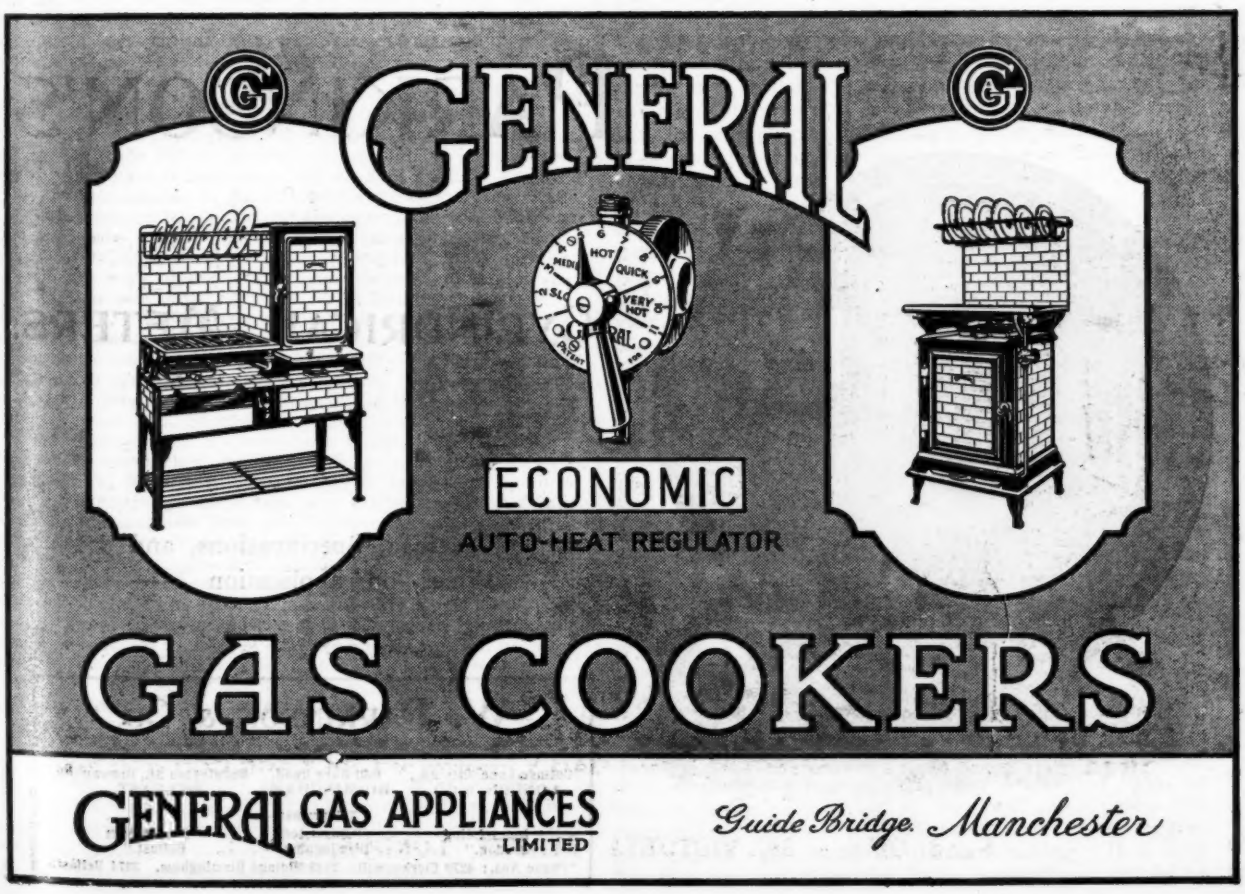

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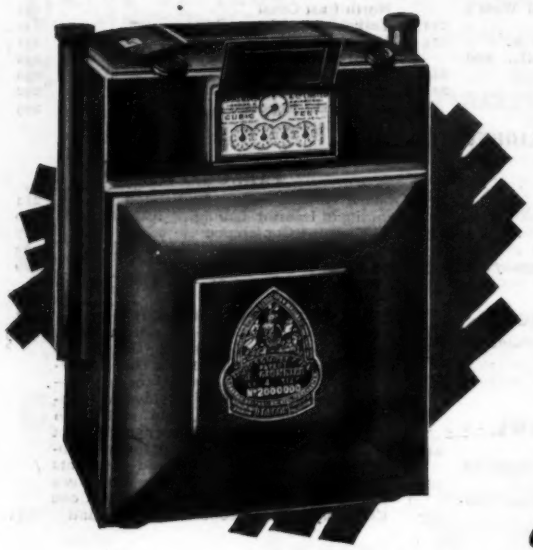

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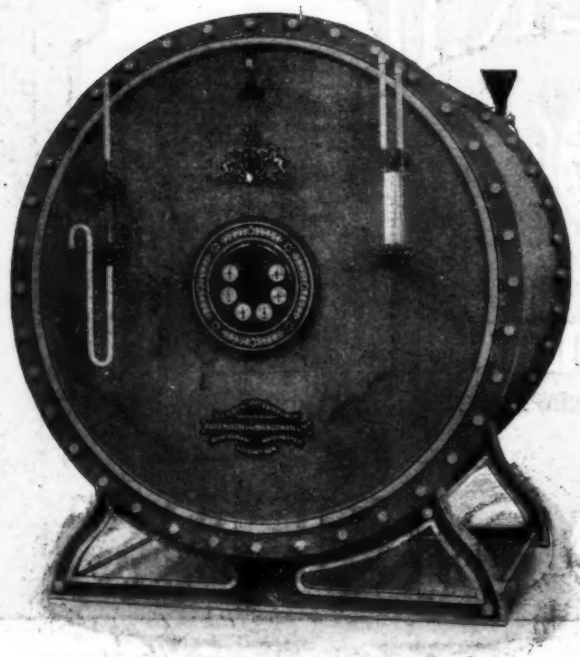

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